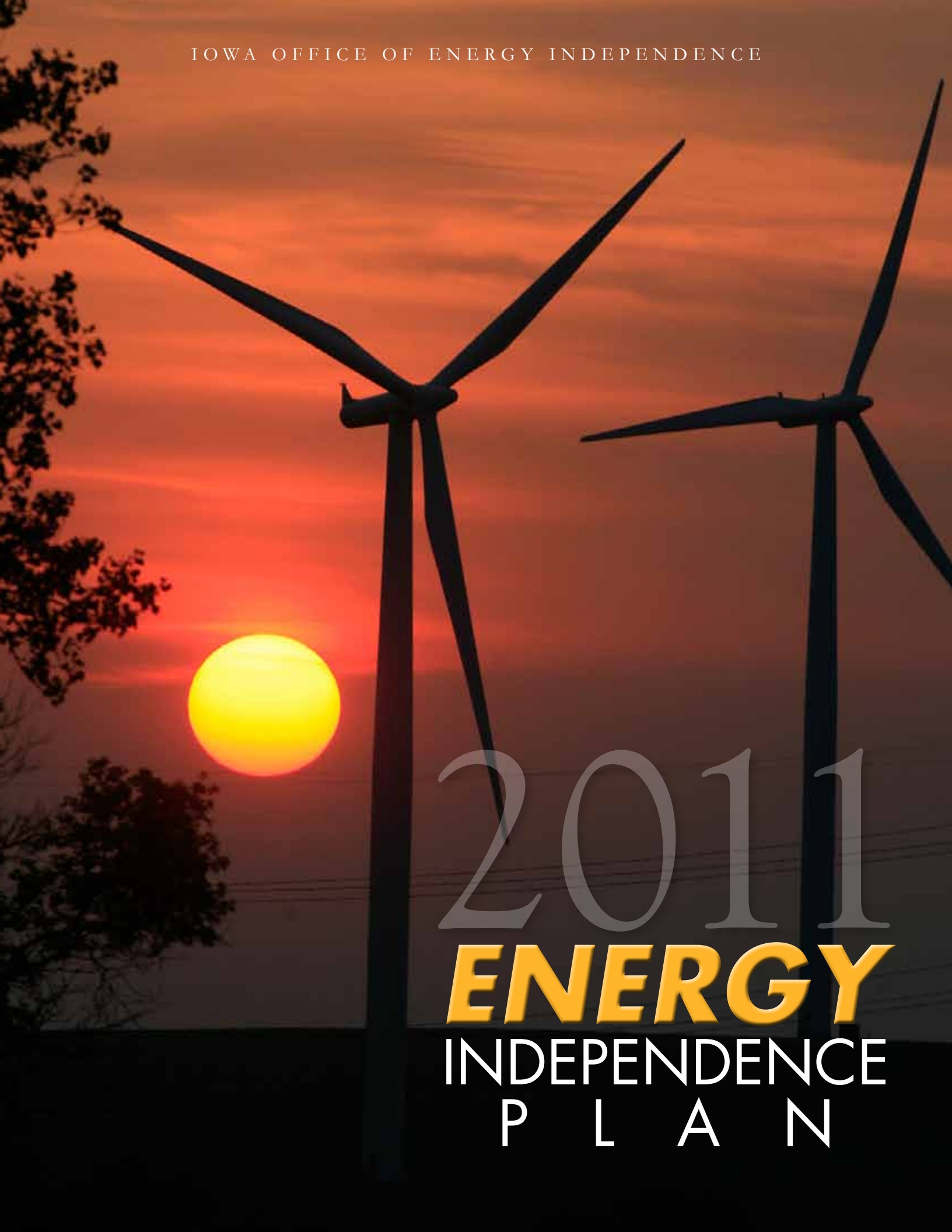
IOWA OFFICE OF ENERGY INDEPENDENCE



2011 ENERGY INDEPENDENCE PLAN

GOVERNOR AND LT. GOVERNOR MESSAGE

We share a strong commitment to the things that we value most in Iowa – family, friends, and the communities in which we live. We are dedicated to creating opportunities that not only improve our standard of living today but the quality of our lives tomorrow.

The collaboration and commitment by Iowans who share a passion and vision of moving Iowa's energy industry forward has created an energy "buzz" sparking local and national attention. Our firm commitment has created opportunities that will lead us toward a clean, energy-efficient, job-producing, and environmentally friendly green economy.

The Iowa Power Fund (IPF) has played a critical role in achieving our vision. By fostering ideas and investing in innovative projects, we have essentially transformed the entire state into a laboratory for driving cutting-edge research and development of technologies that will advance renewable energy in Iowa. These projects capitalize on Iowa's many abundant resources, have created over 2,300 jobs, and will establish long-term economic and environmental benefits that will last well into the future. The Power Fund also ensures that the intellectual infrastructure needed to support the new green economy is in place by providing $2.5 million annually to Iowa community colleges.

Today, Iowa leads the nation in creating renewable energy resources that are cost effective and environmentally sustainable for Iowa and the nation. We lead the nation in biofuels output, rank second nationally in wind energy production, and are recognized as one of the top ten states in investing in energy-efficiency programs. The 2011 Energy Plan and the work of the Office of Energy Independence will continue to focus on moving Iowa forward in the areas that we do well and achieve our end goal of becoming energy independent.

The recommendations in this plan will require continued commitment and collaborative efforts by Iowans who share this vision. Together, we can fully develop Iowa's potential in the biofuels and renewable energy industries, reduce energy consumption, and promote economic growth by creating jobs. ■

Chester J. Culver
Governor of Iowa

Patty Judge
Lt. *Governor*

OEI DIRECTOR'S MESSAGE

Iowa stands at the forefront in energy because of our focused efforts to capitalize on the fundamentals of achieving a clean and sustainable energy future. We have made notable advancements in our leadership role by improving energy efficiency and expanding our renewable energy opportunities in the wind, biofuel, and solar industries.

This Energy Independence Plan allows us to share the progress we have made towards fulfilling the vision we all share of creating an economically viable and environmentally sustainable energy economy. The Iowa Power Fund has supported these efforts by investing in projects that encourage innovation, collaboration, and job growth.

We can be proud of the many accomplishments noted in this Plan, which are a tribute to the hard work and commitment of the citizens of this State. At the same time, we must realize our work is far from being complete. We have a solid foundation to build upon, and I know Iowans are always willing to help get the job done.

The Office of Energy Independence developed a comprehensive approach to identifying the key actions for this Plan by consulting with energy stakeholders, businesses, educational and environmental experts, along with the Iowa Power Fund Board. This Plan outlines key recommendations and the next bold actions that Iowans can take to continue charting a course for our energy future.

We recognize that success in achieving our goals is essential to ensuring long-term energy and economic security. We look forward to continued collaboration with stakeholders and invite contributions from all Iowans who share a commitment to support the new energy economy. ■

Roya Stanley, Director
Office of Energy Independence

IOWA POWER FUND BOARD CHAIR

The Iowa Power Fund Board is comprised of knowledgeable professionals who are passionate about funding solutions to the global energy crisis.

I am proud to serve as chair of a committed group that voluntarily spends countless hours diligently reviewing and selecting projects that support Iowa's and the nation's goal of becoming energy independent. We are prudent about spending the State's resources and have invested in leading-edge research and development, and early stage commercialization of projects that will help Iowa reach its full potential in the renewable energy and renewable fuel industries. The Board has filtered through nearly 400 applications searching for the most innovative projects that not only capitalize on Iowa's abundant natural resources but also promote economic growth, create jobs, provide effective energy education, and encourage energy efficiency.

We take pride in the contributions the Iowa Power Fund has made to advance Iowa's energy industry, and the fact we lead the nation in the biofuel and wind industries. I am pleased with the forward-thinking, sustainable Iowa Energy Independence Plan containing realistic goals and strong commitment to achieving them.

Reducing Iowa's reliance on fossil fuels is important to us today, as well as for generations to come. As I reflect on the work of the Board, I am confident the Iowa Power Fund has enhanced the infrastructure and foundation of the Iowa energy industry and will continue to transform the landscape of the new energy economy. I believe Iowa and the nation will benefit from the work of the Iowa Power Fund Board and the investments made today, which will strengthen tomorrow's energy future. ■

Fred Hubbell, Chair
Iowa Power Fund Board

EXECUTIVE SUMMARY

Iowa has experienced remarkable progress in the past four years as the state has pursued a vision of becoming the nation's energy leader. One of the most profound changes over this time has been a richer understanding of the economic future that can be created in Iowa by adding "Made in Iowa" alternatives to our nation's energy mix.

Built around a strong commitment to transforming our economy through innovation, collaboration, and implementation in the energy industry, the role of the Office of Energy Independence (Office) is to bring together the essential prerequisites for maintaining the long-term health and economic growth of our state.

What is clearer than ever before is Iowa cannot achieve success if any entity chooses to pursue these goals independently. Rather, success requires that we consistently work to achieve our goals through integrated initiatives that place a high priority on moving us forward simultaneously, and on multiple fronts. Success is what our citizens expect from a leading state in the energy industry whose actions carry such far-reaching implications for the economy and the environment.

Clear examples of Iowa's energy leadership can be found daily because it has become integral to how we do business—be it in Power Fund-sponsored research and development that can lead to transformation of how we generate our electricity for our homes and businesses; or ratepayer-funded utility energy efficiency programs that have allowed Iowans to save millions of dollars in energy costs; or state-wide investment in training for the energy jobs of the future or how we fill our tanks with Iowa-produced ethanol. However, with our accomplishments comes the challenge of learning to approach familiar ground in fresh ways.

To build on this foundation and move forward, the state took important steps aimed at raising the impact of Iowa's energy commitment and better integrating it throughout our communities and businesses.

THESE STEPS HAVE INCLUDED NOTABLE OUTCOMES FOR IOWA:

- Leads the nation in wind generation as percentage of total power output at 17-20% (Iowa Utilities Board 2010).
- Ranks second nationally in wind generation capacity rated at 3,670 megawatts from 2,534 turbines across the state (American Wind Energy Association 2010).
- Leads the nation in biofuels output.
- Leads as a top "green economy employment leader", ranking 6th in the nation (Business Facilities Magazine).
- Ranks 12th nationally in promoting energy efficiency in the state. (American Council for an Energy Efficient Economy [ACEEE]).
- Ranks 8th-best in the country for state government initiatives, including Executive Order 6 enacting Green Government Initiatives (ACEEE).
- Leads in state facility energy standards as one of only 15 states having both energy efficiency standards for state buildings and energy efficiency monitoring of those state buildings (ACEEE).
- Leads as one of only 17 states with a state-wide code that meets or exceeds the latest International Energy Conservation Code standards for both residential and commercial buildings (ACEEE).

THESE ACHIEVEMENTS REPRESENT SOME OF THE LATEST STEPS IN WHAT HAS BEEN AN ONGOING JOURNEY—AND IOWA IS SEEING IMPORTANT ECONOMIC BENEFITS.

- An estimated 2,300 jobs are committed to wind manufacturing in Iowa, the most in the nation.
- More than 200 Iowa companies, 9 international, in 26 counties are now supplying the wind industry, generating more than $50 million in new revenue for Iowa companies annually.
- Biofuels output adds nearly $12 billion to Iowa's Gross State Product and the biofuels industry generates $576 million in state tax revenue annually (IDED 2009).
- The economic impact analyses of the Iowa Power Fund projects are available at www.energy.iowa.gov.

As you can see, our state has continued to make progress toward key goals, and there are many areas in which we posted solid results. The Office of Energy Independence invites you to read more about these and other achievements throughout these pages. We also offer our Plan to increase the momentum toward meeting key goals of optimizing energy use, fully developing Iowa's renewable energy potential and maximizing the development and use of biofuels and biochemicals.

Iowans should understand that our state's leadership position as well as our ability to create and maintain wealth from our energy economy is not guaranteed. Other states are seeing the job creation and economy boosting results of our investments and our policies, and they are ready to compete with us for our position in this growing new economy. Without consistent and focused action to achieve our vision, our advantage could slip away.

Again this year in preparing this document, we were fortunate to receive invaluable input from citizens throughout Iowa and our energy stakeholders. By holding public forums in Osage, Iowa City, Kalona, Villisca, Dubuque, Decorah, Des Moines and Le Mars, we were able to speak first hand with community members to gain their insight into what is needed for Iowa to reach its energy potential. Stakeholder groups also provided thoughtful feedback based on their experience and expertise in the energy arena. These observations have strengthened this report, and we greatly appreciate each individual's contributions.

The Office of Energy Independence will continue to strive toward its vision of energy leadership in the year ahead. As we do, you have our commitment that we will be working to extend Iowa's energy strengths in areas where results are already leading, while diligently addressing those aspects of our energy picture in which we see the greatest opportunities for advancement. ■

KUM & GO LED LIGHTING RETROFIT ARRA PROJECT

Convenience Stores Lead the Way for Businesses to Improve Energy Efficiency and Decrease Utility Costs

"LED lighting retrofit is a good investment. If we can encourage other businesses to follow, then we will consider the project a success."

-Adam Hammes
Manager of Sustainability at Kum & Go

A small investment in a LED lighting retrofit can generate huge savings. Kum & Go is leading the way in showing how such a retrofit has the potential to provide businesses with a substantial payback.

Kum & Go owns more than 430 convenience stores throughout 12 states, which vary in age, size and structure. These stores consume a considerable amount of energy. While all the newly constructed stores implement cost-effective and energy-efficient technologies, retrofitting the old stores with new, energy-efficient technology is becoming a company priority. A LED lighting retrofit is one of these improvement efforts.

The majority of Kum & Go stores utilize fluorescent T8 and T12 lighting to illuminate beverage coolers. Compared to fluorescent lighting, LED lighting has the following advantages:

- LED light bulbs are about five times more efficient than fluorescent lights.
- LED lighting can last upwards of 60,000 hours, while fluorescent lighting can last approximately 10,000 hours.
- LED light bulbs do not contain mercury or harmful gases, while fluorescent bulbs contain small amounts of mercury that can be poisonous if the bulb is broken.

Significant energy and maintenance savings could be achieved if existing coolers were retrofitted with LED lighting. Kum & Go, with the assistance of $364,150 in American Recovery and Reinvestment Act (ARRA) grant funds, will retrofit 151 convenience stores in 95 communities across Iowa with LED display cooler lighting. The company will also replace exterior lighting in 10 stores in the state with LED light fixtures in the area lighting, canopy and canopy focus.

The LED cooler light retrofit will begin in January 2011, and is expected to provide Kum & Go with 1,068,759 kWh in annual energy savings. In total, 2,114 fluorescent lamps will be replaced with LED fixtures. The estimated energy reduction is 70.8 percent.

The projected annual cost savings is $100,936. When taking the maintenance savings and available rebate funding into consideration, the LED cooler light retrofit is expected to result in a payback in 1.78 years, which is very attractive to for-profit businesses.

Two local Iowa companies will handle the LED cooler light retrofit. Innovative Lighting, located in Roland, is manufacturing the lights, and Mariek, located in Des Moines, will be installing them. The project is expected to create 12 new jobs. The estimated energy reduction of the retrofit is 63 percent, according to Adam Hammes, Manager of Sustainability at Kum & Go. ■

Following is a list of the recommendations included in this report. Details for each recommendation can be found on the pages identified following the recommendation.

GENERAL RECOMMENDATIONS

- Explore the establishment of an Iowa-based identity for energy that is produced or saved in Iowa (page 26).
- Continue funding of research, development, commercialization, production and expanded use of biofuels and other sources of renewable energy to enhance Iowa's energy leadership role (page 26).
- Expand the Iowa clean technology industry (page 27).

OPTIMIZE ENERGY USE

- Engage the state's energy efficiency and behavior change experts to identify the way in which Iowa can make energy project implementation easy, less time intensive and financially feasible for all Iowans (page 31).
- Focus on increasing efficiency in the industrial sector (page 31).
- Ensure that state government leads by example in energy efficiency in state facilities (page 31).
- Introduce Iowans to the idea of Work Hubs and encourage their implementation (page 37).
- Support Smart Growth and Smart Planning Principles that allow Iowans to use their transportation dollars more efficiently (page 37).

FULLY DEVELOP IOWA'S RENEWABLE ENERGY POTENTIAL

- Advocate for a policy that seeks to fairly allocate costs of transmission development to those who benefit from the development (page 45).
- Actively endorse a federal renewable electricity standard (page 45).
- Support renewal of the federal production tax credit and clean renewable energy bonds (page 45).

MAXIMIZE THE DEVELOPMENT AND USE OF ECONOMICALLY AND ENVIRONMENTALLY SUSTAINABLE BIOFUELS AND BIOCHEMICALS

- Endorse federal policies that support biofuels production and consumption including, but not limited to, the Consumer Fuels and Vehicle Choice Act and the renewal of the ethanol and biodiesel tax credits (page 55).
- Support the installation of blender pumps at retail locations in high intensity traffic areas in Iowa to increase the use of E15 and E85 (page 55).
- Conduct more consumer education about purchasing flex fuel vehicles and encourage owners of flex fuel vehicles to use higher blends of ethanol (page 55).
- Support the use of higher blends of biodiesel (page 55).
- Accelerate improvement in biofuels technologies that reduce the environmental footprint while increasing the efficiency of biofuels plants (page 61).
- Participate in state, regional and national carbon footprint debates to advocate for biofuels to receive fair treatment and the methods used to establish carbon standards are scientifically sound and would not cause undue hardship to the biofuels industry (page 61).
- Support the research and development and early stage commercialization of Iowa's biochemical industry to displace petrochemicals (page 61). ■

"The Iowa Power Fund is what's making energy independence happen in Iowa. The fact that there is an Office of Energy Independence that is focused on energy is making a difference. This project is an example of how Iowa farmers can be a solution to the nation's energy crisis."

-James Sturdevant
Director of Project LIBERTY

POWER FUND CASE STUDY

POET *PROJECTLIBERTY*

One of the First-in-the-World Commercial Scale Cellulose-to-Ethanol Biorefineries

POET – PROJECTLIBERTY

One of the First-in-the-World Commercial Scale Cellulose-to-Ethanol Biorefinery

Iowa has an abundance of natural resources and the ability to produce crops that contribute to both the food and fuel supply. Capitalizing on Iowa-grown resources has added nearly $12 billion to Iowa's Gross Domestic Product, generated $2.8 billion in household income, and generated $576 million in state tax revenue (Iowa Renewable Fuels Association). Developing new technologies that maximize the value of crops will secure Iowa's economic prosperity into the future. The Iowa Power Fund investment of $14.7 million leverages more than $200 million from POET, Inc., to expand ethanol production in Iowa.

POET Project LIBERTY creates the first-in-the-world commercial scale cellulose-to-ethanol biorefinery. It will transform the traditional ethanol biorefinery in Emmetsburg, Iowa, into an integrated corn-to-ethanol and cellulose-to-ethanol biorefinery. While this biorefinery already produces an environmentally-friendly fuel and high-quality livestock feed from corn, Project LIBERTY bolts new technology to the existing biorefinery infrastructure to produce cellulosic ethanol. This project utilizes biomass in the form of corn cobs, husks, and leaves to produce the cellulosic ethanol. "This project will increase ethanol production and farmer revenue without asking farmers to grow more corn," said James Sturdevant, director of Project LIBERTY.

Once cellulose is extracted from the biomass and used to produce ethanol, the waste material is recycled to produce biogas, which can be used to generate power. Enough power can be produced from this material to run 100% of the cellulosic ethanol plant and at least 80% of the adjacent grain-based ethanol plant, significantly reducing fossil fuel consumption.

The immediate impact of Project LIBERTY is important to the Emmetsburg community, which is the home of approximately 3,904 people. Project LIBERTY creates an opportunity for local farmers and the local economy to prosper by creating a new market where the corn crop residue, which was once left as waste, is sold to the ethanol plant to produce the cellulosic ethanol. Today, over 17 million bushels of locally grown corn are used to produce 55 million gallons of ethanol annually. With Project LIBERTY, about 1 bone-dry ton of biomass per acre from more than 50,000 acres of corn will be delivered to the Emmetsburg refinery the first year. This amount is expected to increase to 300,000-400,000 acres of biomass in the future.

This Project will create about 100 full-time jobs and up to 227 seasonal part-time jobs in the Emmetsburg area. New revenue from the corn crop residue will increase net farm income up to $14 million annually. The project also will spark the local economy by utilizing Iowa vendors, suppliers, and subcontractors for plant construction, as well as increase agricultural equipment manufacturing sales.

Utilizing the corn crop residue not only produces economic benefits but has environmental appeal as

well. To ensure long-term, sustainable crop production and environmental goals, only 25% of the cobs and materials that pass through a combine during harvest are used to produce cellulosic ethanol. The remaining 75% is left on the ground for erosion control, nutrient replacement, and other important farm management practices. Experts believe there is no harm to the soil by removing some of the waste and that it could actually increase future corn yields.

In addition, ethanol made from cellulosic feedstocks, including corn crop residue, can reduce greenhouse gas emissions substantially, by as much as 86 percent when compared to gasoline (U.S. Department of Energy). In fact, an independent study showed that greenhouse gas emissions from LIBERTY technologies will be 111% less than greenhouse gasses from gasoline production. The production of ethanol, from feedstock to end use, also requires less fossil fuel energy compared to gasoline. Ethanol made from corn requires about 30 to 35% less fossil energy to deliver a gallon of liquid transportation fuel, on an energy equivalent basis, than used to deliver gasoline. The numbers are even more significant for cellulosic ethanol, which takes just 10 percent of the fossil energy required to produce a gallon of liquid transportation fuel on an energy equivalent basis compared to gasoline. Since about 60% of the oil consumed across the country comes from foreign oil, the same percentage could come from ethanol that is produced from biomass, such as corn stover (U.S. Department of Energy).

The long-term impact and success of Project LIBERTY not only benefits Iowans, but bioerefineries across the country, as the advanced technology can be replicated and used to produce other beneficial co-products. Expanding ethanol production supports economic growth and will reduce Iowa's and the nation's reliance on fossil fuel. ■

ENERGY INDEPENDENCE & IOWA

We are at a time of both great change and great opportunity in energy. The Office of Energy Independence (Office) and the Iowa Power Fund is focused on adoption of both technology and policy that allows Iowa to chart its own course as a clean energy leader. The work of the Office calls on Iowans to re-imagine what it means, and what it takes, to manage our energy future.

ECONOMIC CONSIDERATIONS

Energy independence for Iowa is envisioned through the lens of ensuring global economic competitiveness for our state, in part through wise investments in energy efficiency and renewable energy. Energy independence requires us to take the responsibility to shape our future. This is important because:

- $5.25 billion, or 37% of Iowa's energy expenditures, accumulated to economies of other states or countries (Energy Information Administration).
- Using Iowa-based energy resources kept $133.5 million circulating in the state economy that would have gone elsewhere if it had been used to purchase traditional energy sources (EIA).
- Iowa's 2007 energy expenditures totaled $14.3 billion, about 11% of state GDP in that year. If Iowa follows the projected national trend through 2025, expenditures would be expected to be 79% higher: $24.5 billion. This means that, per capita, energy spending in Iowa would nearly double from $4,577 in 2007 to $8,179 in 2025 while the state's population is projected to grow by less than 0.2% over that same time period.
- In Iowa, our electricity consumption is expected to grow at a rate of 1.9% per year from 2007-2025 (EIA).

ENVIRONMENTAL CONSIDERATIONS

Iowa's energy consumption causes the emission of more than 100 million tons of CO_2 into the atmosphere annually (EIA, 2009). These emissions are believed to contribute to the region's and the nation's climate change impacts. According to research done by the U.S. Global Change Research Program, the Midwest region can expect to see changes such as the increase in precipitation in winter and spring, more heavy downpours and greater evaporation in summer, all of which could lead to more periods of both floods and water deficits.

SECURITY CONSIDERATIONS

Conversations about energy security often include concerns such as import dependency, geopolitical risks, the transfer of wealth to unfriendly regimes and the irony of inadvertently funding our country's own antagonists. While these are clearly important considerations, the damage high energy prices and/or supply disruptions could inflict on our economy are very real. Reduction in transportation capacity, risks to supply chains (especially food), high unemployment, the potential need for rationing and a reduction in standard of living are all critical concerns. The bottom line is that energy supply must be secure for our economy to be sound, and our energy supply must be sufficient to allow positive economic growth. ■

IOWA ENERGY INDEPENDENCE LEADERSHIP RESULTS

- Governor Chet Culver is chair of the Governors' Wind Energy Coalition which advocates for a strong federal Renewable Electricity Standard (RES).
- Governor Chet Culver is chair of the Governors' Biofuels Coalition which develops strategies to advocate for federal legislation that supports biofuels and funding to increase adoption of biofuels.
- The Midwestern Greenhouse Gas Reduction Accord (Accord) was formed by the Governors of Iowa, Illinois, Kansas, Michigan, Minnesota and Wisconsin. The Accord issued final recommendations that establish targets for greenhouse gas emission reductions in the region, as well as designed a regional cap-and-trade program so that the Midwest will have a regional influence on the federal cap-and-trade climate policy.
- Iowa is recognized as one of the top alternative energy industry leaders in 2010 receiving a second in the nation ranking because of our ongoing success in wind turbine manufacturing, as well as our role as a major ethanol producer *(Business Facilities Magazine)*.
- Iowa is recognized as the national leader in biofuels manufacturing research attributed to the Iowa Power Fund's investment in research, development, and deployment of cutting edge biofuels technology *(Business Facilities Magazine)*.
- Iowa is recognized as the national leader in manufacturing wind energy equipment and supplies because of the number of companies in the state that build blade, tower and turbine components, the number of wind energy jobs, and the investment of almost $250 million that supports this industry in the state *(Business Facilities Magazine)*.
- Iowa is recognized as one of the top green economy employment leaders ranking 6th in the nation *(Business Facilities Magazine)*.
- Iowa is recognized as one of the best education climates for creating education and training programs that support workforce demands compared to other states ranking 7th in the nation *(Business Facilities Magazine)*. ■

- ESTABLISHED IN 2007, THE IOWA POWER FUND – a four-year state investment totaling $95.27 million encourages and supports research, development, early stage commercialization and implementation of energy technologies and practices that will reduce Iowa's dependence on foreign sources of energy and fossil fuels. Since its inception, the Iowa Power Fund has:
  - Received 335 grant applications requesting more than $699.2 million with more than $2 billion in matching funds. The Iowa Power Fund Due Diligence Committee and Board made investment decisions from this pool of applications.
  - Allocated over $47.2 million to 37 projects that leveraged over $295.4 million from other resources for cutting edge research and deployment of innovative technologies that will help secure Iowa's and the nation's energy security, as well as contribute to Iowa's national leadership in wind, ethanol and biodiesel production.
  - Selected additional projects to negotiate contracts for more than $35 million in Power Fund investment to be matched with more than $326 million.
  - Provided $9.75 million to community colleges for development and delivery of energy-related curriculum and workforce development.
  - Assisted with flood recovery in Iowa, allocating $7.5 million to assist individuals and businesses rebuild homes and buildings with energy efficient equipment and materials.
  - Provided Community Grants of more than $850,000 to schools, cities and communities for energy efficiency and renewable energy investments.
  - Returned $2.775 million to state's general fund due to budget cuts.
- ENACTED EXECUTIVE ORDER 6 TO GREEN STATE GOVERNMENT by integrating clean energy, environmental protection and resource conservation programs, policies, and procedures into all appropriate aspects of government. The Green Government Initiative resulted in establishing the goal of a 15% reduction in the use of natural gas, fuel oil, electricity, and water in state buildings by 2013, as well as establishing other green government standards
- ENACTED EXECUTIVE ORDER 16 WHICH CREATED THE GREEN JOBS TASK FORCE responsible for encouraging growth in energy related industries and creating green collar jobs, ensuring a qualified, trained workforce that supports the evolving energy industry, improves efficiencies in state government, and promotes research and development and deployment of cutting edge renewable energy technology.
  - Work by the Green Jobs Task Force led to Iowa Workforce Development being awarded the State Energy Sector Partnership (SESP) Grant. This grant supports the green economy workforce by investing over $5.7 million to create education and training programs that will help 4,153 individuals prepare for energy-related jobs.
- ENACTED EXECUTIVE ORDER 20 WHICH REQUIRED STATE FACILITIES TO BECOME MORE ENERGY EFFICIENT.
  - The Office is leading the charge by collaborating with state agencies and Regents institutions. With a $7.5 million grant through the State Energy Program administered by the Office and funded under the American Recovery and Reinvestment Act, state facilities are undergoing more than $22.8 million in energy efficiency retrofits that will save taxpayers more than $3.2 million per year in energy costs and create more than 340 jobs.

Additional projects will be undertaken in the next few years to meet the expectations of Executive Order 20.

- OTHER STATE AGENCY AND RELATED PLAN INFORMATION:
  - The Iowa Department of Economic Development published the Infrastructure Strategy for Iowa's Future Economy Report that creates a list of priority issues and corresponding recommendations supporting the future Iowa energy economy.
  - The Iowa Department of Economic Development implemented the Green Streets Initiative which integrates a consistent, environmentally conscious approach to growth and development, while ensuring long-term economic growth for Iowa communities.
  - The Iowa Department of Transportation published the Time-21 Funding Analysis, which provides a strategy to address the shortfall in funding necessary to meet critical public roadway improvements.
  - The 2009 Iowa Climate Change Report provides policy recommendations to the Iowa General Assembly for reducing greenhouse gas emissions, increasing energy efficiency, advancing clean, renewable energy, and advancing environmental and economic improvements in transportation and land use, agriculture, forestry, and waste management, and other cross cutting issues.
  - The Iowa Department of Public Safety oversees the Iowa Building Code, which incorporates state energy code provisions. The State Energy Code is a subject of significant interest. In 2008, the Iowa General Assembly enacted legislation creating the Commission on Energy Efficiency Standards and Practices. The Commission, which has a two-year life, is scheduled to deliver its final report by January 1, 2011.
  - The Iowa Department of Human Rights, Division of Community Action Agencies, administers the Weatherization Assistance Program, a federal low-income home energy efficiency program. The Weatherization Assistance Program helped 6,504 homes to become more energy efficient in Program Years 2007-09, with first year energy savings totaling 7.3 million kWhs, 1.4 million therms, and 183,000 gallons of liquid propane for these three years. Average annual savings per home was approximately $370. Total estimated savings over the life of the measures exceeds $48 million in home energy costs. The program has created 275 new jobs and trained hundreds of individuals, contractors and evaluator staff in home weatherization methods and technology utilizing the American Recovery and Reinvestment Act funding.

- STATE ENERGY-RELATED CENTERS' PROGRESS INFORMATION
  - The Iowa Energy Center supports economic growth and the energy industry by:
    - Administering the Alternative Energy Revolving Loan Program, which is available to individuals and organizations that build renewable energy production facilities.
    - Conducting and sponsoring energy related research.
    - Conducting biomass-to-energy conversion research at the Biomass Energy Conversion facility.
    - Sponsoring energy-related educational workshops and conferences.
  - The Center for Energy and Environmental Education (CEEE) aims to empower Iowans with the knowledge, experiences, tools, and inspiration needed to create a sustainable future for our communities. The CEEE 2008-2011priorities include:
    - Leveraging CEEE programs and expertise to raise public awareness around key energy and environmental issues and promote positive solution orientated responses.
    - Creating opportunities for UNI students and faculty to take leadership roles in creating more sustainable communities.
    - Fostering community energy and environmental leadership through working groups to develop dynamic new partnerships.
    - Developing consulting services for businesses and community based and public sector organizations.
    - Significantly increasing funding levels to develop new and sustain existing CEEE programs.
  - The Center for Global and Regional Environmental Research (CGRER) promotes interdisciplinary research on the many aspects of global environmental change. Areas of focus include regional effects on natural ecosystems, environments, and resources, and effects on human health, culture, and social systems. To accomplish its missions, CGRER awards seed grants, fosters interdisciplinary courses, provides state-of-the-art research facilities, and holds seminars and symposia. Through these activities, CGRER assists Iowa's agencies, industries, politicians, and citizens as they prepare for accelerated environmental change. ■

"I can't think of anything that will have more of an impact on future generations than the investments made by the Iowa Power Fund and the Office of Energy Independence. Solid investment decisions made by OEI and the Iowa Power Fund Board will secure energy independence for Iowa."

-Roy Buol
City of Dubuque Mayor

POWER FUND CASE STUDY

CITY OF DUBUQUE *ENERGY EFFICIENCY*

First-In-The Nation Integrated Approach To Monitoring Energy Consumption

CITY OF DUBUQUE: SMARTER, SUSTAINABLE ENERGY EFFICIENCY PROJECT

First-In-The Nation Integrated Approach To Monitoring Energy Consumption

The City of Dubuque is facilitating a first-in-the-nation integrated approach to monitoring energy consumption patterns that stretch across energy silos – electric, gas, water, and vehicle miles driven. The integrated research will focus on implementing new technologies that help consumers, cities, and communities manage energy consumption, as well as educate the public on the methods and benefits of reducing energy costs.

In conjunction with its partners, Iowa Power and Light and IBM, the City of Dubuque is implementing a pilot program that will monitor the electricity consumption of 1,000 Dubuque homes. "The business plan is simple. We give individuals and businesses data and knowledge about their electricity consumption which can help them make sound energy decisions, as well as alter consumption habits," said Dave Lyons, Smarter Sustainable Dubuque Project Manager.

This sustainability project demonstrates that when you reach to the core of a community—kids, parents, grandparents, and business owners—and provide them with tools and services that provide real-time information about themselves, amazing things can happen. The technology is currently being used in Dubuque to monitor water consumption with great success. With the tools and technology implemented in the pilot program, parents are able to show their children just how much a 20-minute shower costs and what the savings would be if they cut the shower time in half. The same types of results are expected when individuals monitor their electricity consumption.

Homeowners are able to compare home appliance energy use with national standards and calculate the savings if they decide to upgrade. The system has provided individuals with data that has helped them identify leaks and other inefficiencies, and assisted people in making decisions that impact environmental and economic savings.

The City of Dubuque and its partners are ramping up the benefits of participating in the pilot program, which is gaining national attention. Households compete as teams for prizes, which makes each household accountable for their energy use. City officials believe that the competition has engaged all members of a household, especially kids who most likely have paid no attention to energy consumption in the past. "The most celebrated form of change is at the grassroots level," said City of Dubuque Mayor Roy Buol. "This project gives everyone information to change their energy and resource use habits."

The outcome of this innovative research and development project will be a comprehensive model for aligning energy and resource efficiency efforts across energy silos and among all of the stakeholders in Dubuque. It will not only create a replicable model for small- to medium- sized cities in Iowa and the United States, but also will provide a place for hands-on application of new technologies that have broad applications in national and global markets. Tools and services that can be deployed as best practices will be available to other communities when the project ends. The technology developed and implemented in the City of Dubuque results in three categories:

1. Information and tools that eliminate waste. Smart meters help identify leaks or other areas of concern and they calculate the return on investment for fixing them.
2. Efficiency tools. Once participants have data, they can find inefficiencies and fix them or compare, for example, the energy used by their current appliances with newer versions and calculate the savings if they upgraded to the newer version.
3. Analysis tools. Queries can be run to optimize the participants' relationship with their information and utilize data sets to perform an analysis and generate energy savings.

The Iowa Power Fund investment totaling $1.4 million leverages resources totaling $13.7 million from a public/private partnership to research and develop technology capable of monitoring and measuring real-time electrical energy consumption. The City of Dubuque, in partnership with IBM and Iowa Power and Light, has put the power to improve energy efficiency, reduce energy consumption, and save money into the hands of individuals and communities. The integrated technology tools, when combined with comprehensive community engagement programs and services, will dramatically influence energy consumption patterns, improve the environment, and promote economic growth. Just as important, residents of the City of Dubuque will have data and information necessary to make sound energy efficiency decisions today that impact future generations.

Once rolled out to the entire community, it is likely that participating households will educate others in the community about increasing energy efficiency and saving money. Schools could compete against other schools which will engage students and empower them to learn about how energy improvements result in savings. Households and businesses can monitor individual energy consumption, compare it to others in the community, and have solid information to make sound energy efficiency decisions. The opportunities are endless. This project impacts Iowans today, as well as establishes our carbon footprint for tomorrow. ■

VISION FOR THE FUTURE

Harnessing the power of fossil fuels has allowed for unprecedented wealth and opportunity for our country and our state. It has also created challenges to our security, economy and environment, and these challenges have sharpened our focus on being able to control our own energy future. Iowa has the resources to create an economically viable and environmentally sound energy future.

By breaking down the barriers that have prevented widespread adoption of energy advances, by expertly using our natural-based resources ideally suited for providing safe, reliable energy to our nation and by investing wisely and educating our citizens, Iowa will continue to lead the nation in moving toward energy independence.

This Plan outlines specific goals, targets and needed actions in the areas of energy efficiency, renewable energy and biofuels. By optimizing energy use, fully developing Iowa's renewable energy potential and maximizing the development and use of biofuels and biochemicals, Iowa can shift from an energy future dependent on sources that limit our choices to one that creates limitless opportunity. We must set our sights on additional actions that encompass our state's overall aim to transform the energy economy. These are actions that will bring about the innovation, collaboration and implementation necessary for transformation to occur.

INNOVATION: EXPLORE THE ESTABLISHMENT OF AN IOWA-BASED IDENTITY FOR ENERGY THAT IS PRODUCED OR SAVED IN IOWA

We know that when people think of something made in Iowa, they often think of that product as being practical, wholesome and economical. As Iowans, we know that energy made in Iowa is all of that and more – it is cleaner, more sustainable, often less expensive and more secure than many other energy choices. By establishing an Iowa identity for our energy efficiency, renewable energy and biofuels, we can build on our established market perception, while breaking down barriers and unfounded myths about these products.

Along with an engaged, broad group of key stakeholders, the Office of Energy Independence will bring about an effort in 2011 to explore the idea of identifying Iowa's energy efficiency, renewable energy and biofuels as proudly produced in Iowa. The emphasis in this process will be on helping Iowans and the nation know why making the choice to supply or purchase these Iowa products is good for the economy, the environment, for national security and for people. Equally important will be supporting work to ensure that once people know why they should make these purchases, they know how. The intent will not be to select particular electrons or gallons of fuel that are entirely "Made in Iowa", instead the effort will be to inform Iowans and others about the types of fuels, equipment and energy programs delivered here, why they are so critical to the state and how they can support the use of these fuels.

While it is easy for most people to understand renewable energy and biofuels as products, it can be more difficult to see results of energy efficiency as a "product" for Iowa. Special attention in this effort will be paid to ensuring that Iowans know why becoming energy efficient is a wise economic choice and helping Iowans know how to make those choices using our state's established program delivery network. The effort will also focus on informing Iowans about energy efficiency services and equipment that are Iowa's.

IMPLEMENTATION: CONTINUE FUNDING OF RESEARCH, DEVELOPMENT, COMMERCIALIZATION, PRODUCTION AND EXPANDED USE OF BIOFUELS AND OTHER SOURCES OF RENEWABLE ENERGY TO ENHANCE IOWA'S ENERGY LEADERSHIP ROLE

While we certainly can claim a leadership position, we cannot be complacent. Many other states have grant programs, investment pools, incentives and talented researchers. To maintain our leadership we must not only encourage investments in Iowa in innovative energy industry initiatives, but we must also have an organization that coordinates the state's effort to attract the most innovative and productive businesses to Iowa to create jobs now and in the future.

In the coming year, the Office of Energy Independence proposes to build strong partnerships with other public and private sources of capital to enhance Iowa's impact on individual projects and the overall energy market. By creating funding packages for attractive projects that include not only state dollars, but also private partner funding, financing and/or venture capital coordinated by the Office, we can systematically decrease the need for the state's investment, while growing the state's return.

The Iowa Power Fund has been a critical catalyst, placing Iowa at the forefront in energy through research and development, knowledge transfer, technology innovation and enhancing Iowa's economic competitiveness. Plainly spoken, many of the company location decisions, research project breakthroughs and pivotal educational opportunities in Iowa would not have happened without the Power Fund's investment. With the support of the Iowa Power Fund, researchers at Iowa's universities and progressive companies attracted to or based in Iowa have begun important energy technology research and development. To supply the skilled workforce necessary for the future, the Iowa Power Fund has provided funding to community colleges for job training in energy-related sectors. While maintaining focus on creating long term wealth in Iowa's energy economy through game changing innovations, the investment of $47.2 million has leveraged $295.4 million in additional investment in Iowa. For further information regarding the economic impact of the Iowa Power Fund please visit: www.energy.iowa.gov.

Establishing an effective mix of programs, policies, incentives and tools necessary to maintain and grow Iowa's leadership in the energy industry will be critical to remaining ahead of the pack. Coupled with the menu of options, Iowa must make it accessible for the right businesses and research organizations to access our incentives and build their future in Iowa rather than in other states or nations. Creating well coordinated programs and incentives will build an energy economy based on conditions and resources unique to Iowa, ensuring that the energy jobs we create are permanent Iowa jobs – jobs that can't be outsourced because they can only happen here.

COLLABORATION: EXPAND THE IOWA CLEAN TECHNOLOGY INDUSTRY

As we move rapidly toward delivering on the promise of the new energy economy, Iowa's technology strategy must be to enhance our lead by building the complementary relationships among a broad array of experts in science, math, technology, social sciences, economics, finance, management, political science and engineering. Skilled science researchers and technology experts are central to influencing the future of technological development by the choices they make. Iowa will rely on these people to achieve full market transformation and the effective creation, commercialization and institutionalization of sustainable energy technologies.

By focusing time and effort on developing effective partnerships with U.S. Department of Energy federal labs, including Ames, Argonne, Oak Ridge, the National Renewable Energy Laboratory and others, Iowa will gain an advantage that can bring both funding and clean technology businesses to Iowa. In the next year, In the next year, the Office of Energy Independence will dedicate staff to establish strong relationships with labs to ensure that the federal leaders know about Iowa's landscape, allowing the direction of projects and investments to match our unique characteristics. Conversely, these relationships will also help us to ensure that Iowa's public and private sector leaders know how best to package our existing assets to leverage federal resources in the state.

However, the science researchers and technology experts cannot effect the changes alone. It takes everyone including the policy makers, technology experts, training and educational organizations and those who lead our markets to work together to do as Iowans have always done, build strong cooperative coalitions of people to achieve great results.

It is, after all, our people who can best lead our state to the next level in the new energy economy. ■

TARGET: INCREASE ENERGY EFFICIENCY IN FACILITIES BY INSTALLING ALL COST EFFECTIVE ENERGY IMPROVEMENTS

Energy saved is the least costly, least polluting energy we have. For Iowa, the added bonus to saving energy is the multiplied benefits to our overall economy. Our energy consumption is based heavily on imported resources. Being dependent upon these resources provides a pay day to the pocketbooks of other states and nations. More than $5.25 billion, or 37% of Iowa's energy expenditures, accumulated to economies of other states or countries (EIA). This is money we could maintain here in Iowa by optimizing our energy use and investing in homegrown energy resources.

Iowa has a two decade history of investing in energy efficiency through ratepayer funded programs administered by utilities. These efforts were recently recognized as being among the nation's leaders by the American Council for an Energy Efficient Economy. Because of these programs, we have enjoyed the benefits of job creation, cost savings and environmental risk reduction.

Iowa also leads the nation in adopting strong building energy codes. With the January, 2010 adoption of the 2009 International Energy Conservation Code, Iowa was one of the first states in the nation to increase to this new standard. While adopting the standard is a necessary step toward its implementation, much of the code's enforcement is left to local jurisdictions. Some communities have implemented effective energy code enforcement and many utility programs have put incentives in place to push the construction of new buildings beyond basic code standards. At the same time, many of Iowa's communities are unable or unwilling to enforce the code due to limited resources for these types of activities and lack of locally available trained officials. The state's Department of Public Safety has begun the development of an assistance program for communities that is expected to yield an increase in building energy code enforcement.

The Office of Consumer Advocate has led an effort to improve the state's ratepayer funded energy efficiency programs through a series of collaborative meetings. These regular meetings of broad stakeholder groups (utilities, consumer representatives, environmental groups, state agencies, service providers and others) have allowed for rigorous discussion about the opportunities for deepened impact of the programs. They have also provided a forum for the Iowa stakeholder groups to learn about practices in other states and discuss opportunities to weave together a variety of good ideas to expand the utility-delivered energy programs' return on investment.

The state's long term commitment to energy efficiency is laudable, and with this firm platform from which to build, we can achieve even greater results. Despite our work to date, Iowa still uses more energy per unit of economic output than any other state in our region (Energy Information Administration). While there may be many reasons why this is true, the bottom line for business is that in this globally competitive market, controlling cost and risk is critical and implementing energy efficiency improvements is one way to achieve both goals.

Here in Iowa, our aging building stock represents an opportunity to significantly increase energy efficiency and reduce greenhouse gas emissions. To do this, we need to address all aspects of the design, construction, operation and deconstruction of the built environment. We also must make it easier for building owners to access energy efficiency improvements by reducing their time commitment and making financial resources more readily available.

The industrial sector consumes 41% of the total energy used in the state followed by the transportation (25%), residential (19%) and commercial (17%) sectors.

To optimize energy use, the 2011 Energy Plan focuses on increasing energy efficiency in industry. Additionally, to increase market penetration of the state's existing programs, the Plan recommends engagement focused on making energy efficiency easy for Iowa consumers. Further, to ensure that taxpayer funds are used wisely, we focus on helping state government buildings lead by example.

In Iowa, by implementing all achievable cost-effective energy improvements outlined in the utilities' current 5 year (2009-2013) energy efficiency plans, Iowans can reduce energy consumption by year-end 2013 by 6.2 percent. This could result in energy cost savings of approximately $69 million per year. ■

KEY RECOMMENDATIONS FOR 2011

ENGAGE THE STATE'S ENERGY EFFICIENCY AND BEHAVIOR CHANGE EXPERTS TO IDENTIFY THE WAY IN WHICH IOWA CAN MAKE ENERGY PROJECT IMPLEMENTATION EASY, LESS TIME INTENSIVE AND FINANCIALLY FEASIBLE FOR ALL IOWANS.

- Focus on developing the resources necessary to promote energy efficiency program availability and financing; deliver easy to understand, comprehensive, state-wide consumer information on energy efficiency.
- Investigate the pathways to provide additional training and certification for people in the energy efficiency industry to ensure quality analysis and implementation for all Iowans.

FOCUS ON INCREASING EFFICIENCY IN THE INDUSTRIAL SECTOR.

- Establish a revolving loan program to finance energy efficiency projects.
- Develop industry case histories that provide examples and illustrate the return on investment for energy efficiency improvements and communicates how energy efficiency may help meet future compliance requirements and reduce risk.
- Establish networks of businesses to allow the sharing of information and resources and to create recognized energy efficiency leadership within the business community.
- Incorporate other existing assistance programs into the effort to ease the burden for business participation, including waste management, process optimization, related permitting and environmental compliance.
- Establish a loan fund.

ENSURE THAT STATE GOVERNMENT LEADS BY EXAMPLE IN ENERGY EFFICIENCY IN STATE FACILITIES.

- Identify opportunities statewide for cost effective investment in energy efficiency in state facilities and provide the financing/technical assistance necessary to implement those improvements within the goal timeframe.
- Publicize state energy efficiency efforts to inform Iowans about the opportunities for energy efficiency in similar commercial/residential or industrial applications.
- Evaluate and adopt a data management/benchmarking tool that allows state government and all Iowans to track energy efficiency needs and progress within state agencies; use this tool with a future focus to make it available for all public facilities.

POWER FUND CASE STUDY

TRI-PHASE *DRYING TECHNOLOGIES*

Building A More Energy Efficient, Enviornmentally-Friendly Industrial Dryer

"We really appreciate the funding provided by the Power Fund to enable Tri-Phase to design and install the first commercial unit, which greatly facilitates the ability to attract both customers and equity investors. Without the support, this would not be happening."

-Steve Shivvers
President of Tri-Phase

TRI-PHASE DRYING TECHNOLOGIES PROJECT

Building A More Energy Efficient, Enviornmentally-Friendly Industrial Dryer

America's industrial sector is a big player when it comes to energy consumption, accounting for more than one-third of all the energy used in the U.S., as well as 27% of the nation's carbon emissions (U.S. Department of Energy). Because of its substantial impact on the country's economy and environment, it makes sense that U.S. industry is one critical area to focus on when exploring solutions for energy efficiency.

With the support of the Iowa Power Fund, Tri-Phase Drying Technologies, LLC, of Norwalk, Iowa, is offering what they say is a more energy-efficient industrial dryer that will also significantly reduce greenhouse gas emissions. Tri-Phase Drying is installing the first, full-scale commercial Tri-Phase II Dryer at American Natural Soy in Cherokee, Iowa. American Natural Soy is an organic processor of oils, flour and meal primarily from soy and canola seeds. The dryer, which will be used to dry soybeans, should be operational in February 2011. The project includes the final design, build, installation and monitoring of the new dryer. The Power Fund's investment of $300,000 leverages $329,277 in matching funds.

"10% of energy consumed by industry is spent drying something," said Steve Shivvers, president of Tri-Phase. "So saving a portion of that can be highly significant. This saves the company who is doing the drying a substantial amount of money, and environmentally, it saves a lot of CO2 emissions."

The new technology saves about 75% of the energy typically consumed in an industrial drying process, Shivvers said. The Tri-Phase II Dryer will consume approximately 500 to 600 BTU or less to evaporate one pound of water; that's compared to the typical average of 2,000 BTU. The new dryer replaces the current, inefficient dryer at American Natural Soy, which consumes about 4,000 BTU—that translates to a savings of approximately $40,000 to $50,000 per year. The manufacturer will also reduce its carbon dioxide emissions by 220 tons with the Tri-Phase II Dryer.

In recent decades, overall energy use in the industrial sector has seen strong growth, according to the International Energy Agency. Worldwide, nearly one-third of energy consumption and 36 percent of carbon dioxide emissions can be attributed to manufacturing industries.

The vast majority of industrial drying operations use natural gas, with a few using liquefied petroleum gas, Shivvers said. The Tri-Phase process uses electricity, employing the same technology used in the geothermal heating of homes.

A range of industries in Iowa, as well as those outside of the state and internationally, stand to benefit from this technology. While this specific project applies to the drying of soybeans, a variety of other products will be able to be dried using the Tri-Phase II process, including corn germ; dried distillers grains with solubles; dog, cat and fish food; and texturized soy protein. With the commercialization of their process worldwide, Tri-Phase foresees the creation of about 80 advanced manufacturing, managerial, engineering and marketing-related jobs in Iowa by 2015. The company estimates that continued exposure in the industrial drying market will lead to even more jobs in the state.

Tri-Phase estimates that a 2% penetration of industrial drying applications in North America and Europe will yield annual energy savings of 31 trillion BTU—that is equivalent to the annual heating and electrical energy consumed by 300,000 American households, or the annual energy produced by 3,000 1-megawatt windmills. There would also be annual carbon dioxide reductions of 1.9 million tons (from declines in natural gas use), equivalent to removing .3 million cars from America's roads. ■

TARGET: DECREASE VEHICLE MILES TRAVELED BY 10% BY 2025

In Iowa and in the nation, there is a growing concern that current development patterns are no longer in the long-term interest of our cities, existing suburbs, small towns, rural communities or wilderness areas. Though support of growth, communities are questioning the economic costs of abandoning infrastructure in the city, only to rebuild it further out (The Smart Growth Network). Smart Planning is development that is environmentally sensitive, economically viable, community-oriented, and sustainable, and it often addresses one of the most significant transportation concerns: reducing vehicle miles traveled while maintaining high quality of life and consumer choice.

Investing time in Smart Planning will allow Iowa communities to think strategically about their resources when revitalizing their city centers to become more compact, transit-oriented urban communities that are more energy efficient and sustainable.

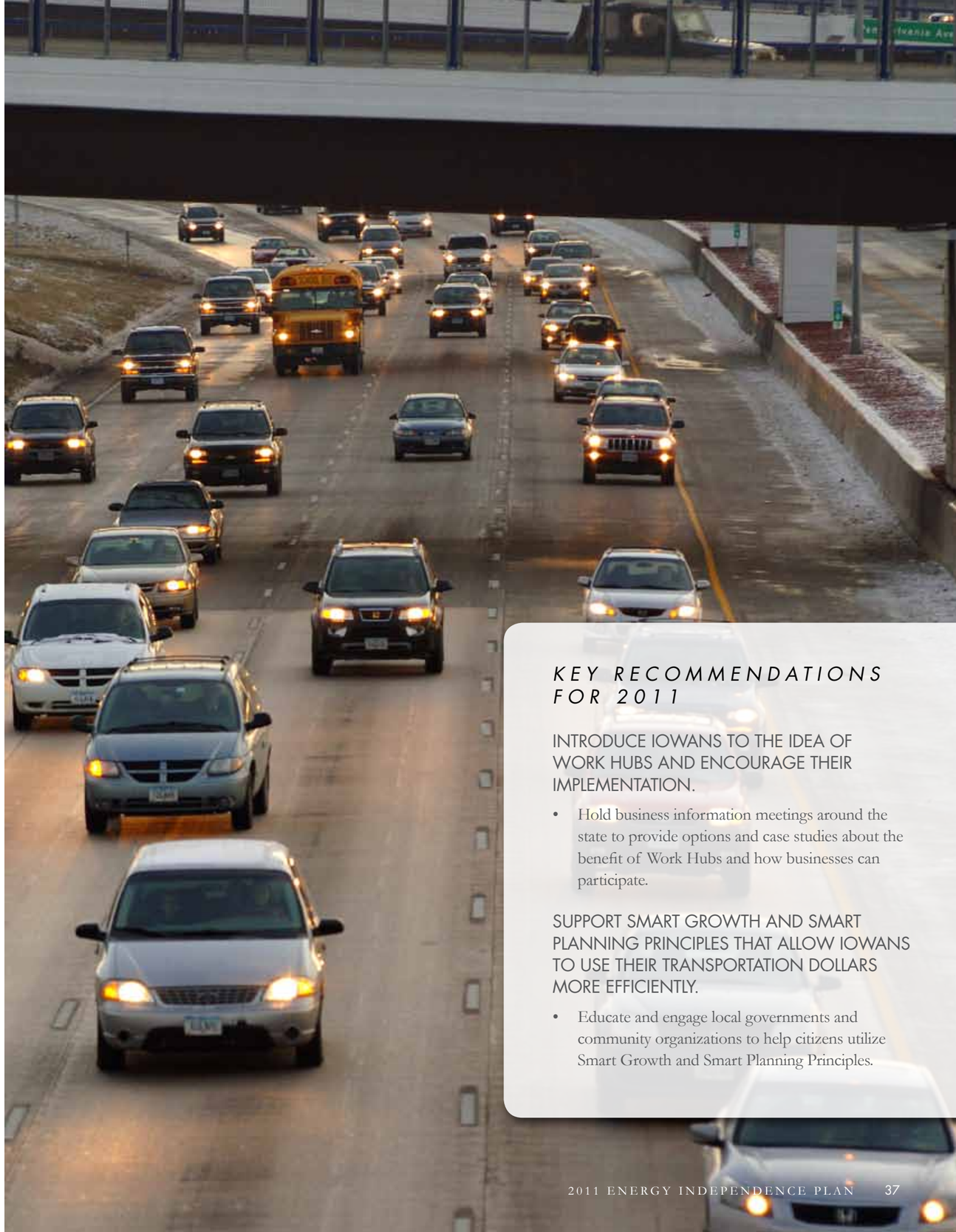
Iowa has many rural communities and many individuals commute more than 30 miles to work daily. Overall, Iowans travel $31.2 million miles annually (Iowa Department of Transportation). Approximately 25% of a household's total energy consumption comes from transportation. Choosing a more efficient vehicle, using public transportation and using an environmentally friendly fuel such as ethanol will help Iowans reduce both their costs and risks associated with environmental pollution.

The 2011 Iowa Energy Plan introduces a strategy to move toward reducing the number of vehicle miles traveled by introducing the "Work Hub" concept to Iowa employers and individuals.

Many Iowans are commuting longer distances to work in an office where they spend most of their time on the phone or on the computer, which could easily be performed from an alternative work location with the right telecommunications technology. By capitalizing on advances in technologies, Iowans can telecommute from a variety of work environments: home, an Iowa Communication Network center, wireless hotspots and work hubs. Work hubs can be established in key areas around the state, shortening the distances employees travel while providing an environment for normal business activities.

The vehicles driven today release over 1.7 billion tons of carbon dioxide (CO_2) into the atmosphere each year. Each gallon of gasoline burned creates 20 pounds of CO_2, which is about 6 to 9 tons of CO_2 for a typical vehicle. By introducing Iowans to the concept of "work hubs", the total amount of miles traveled will be reduced, the amount of carbon dioxide released into the environment is reduced and individuals will have more time and money to spend in their communities.

Work hubs optimize energy consumption by using improved telecommunication technology and alternative business practices to reduce vehicle miles traveled. This will reduce fossil fuel consumption, promote a cleaner environment and secure economic prosperity into the future. The 2011 Energy Plan recommends strategies to educate Iowa employers about the benefits of work hubs, as well as outlines options that will help employers implement the concept. ■



KEY RECOMMENDATIONS FOR 2011

INTRODUCE IOWANS TO THE IDEA OF WORK HUBS AND ENCOURAGE THEIR IMPLEMENTATION.

- Hold business information meetings around the state to provide options and case studies about the benefit of Work Hubs and how businesses can participate.

SUPPORT SMART GROWTH AND SMART PLANNING PRINCIPLES THAT ALLOW IOWANS TO USE THEIR TRANSPORTATION DOLLARS MORE EFFICIENTLY.

- Educate and engage local governments and community organizations to help citizens utilize Smart Growth and Smart Planning Principles.

PROGRESS IN OPTIMIZING ENERGY USE

- The Building Energy Smart (BE$T) program, offered by the Office of Energy Independence, provides technical and financial assistance to cities, counties, school districts and public entities to improve energy efficiency. Over $3.7 million in energy improvements is expected to be implemented in Iowa public sector buildings as a result of this program.
- American Recovery and Reinvestment Act appliance rebates provided more than $1.9 million in rebates to more than 7,100 Iowans for the purchase of highly efficient Energy Star appliances, many of which are made in Iowa.
- In 2008, the Iowa Investor Owned Utilities' (IOU) programs achieved new "first-year" electric energy savings of 290,000 MWh, an increase of about 150% from savings in 2002. IOU electric energy savings grew to a level of about 0.8% of retail sales (from about 0.4% of sales in 2002). In addition, these programs:
  - Attained 2008 cumulative electric-peak demand savings of about 1,100 MW, with about 600 MW of savings from energy efficiency and 500 MW from "demand response" programs.
  - Achieved 2008 natural gas savings of about 780,000 MCf (thousand cubic feet), amounting to more than 0.6% of natural gas retail sales.
  - Spent about $82 million on electric energy efficiency and load management, and about $30 million on natural gas energy efficiency. These expenditures represented about 3.8% of electric retail revenues and 2.2% of natural gas retail revenues.
- The Iowa Utility Board approved new IOU energy efficiency plans for the years 2009 – 2013 that develop and introduce new programs for Home Performance with Energy Star and other residential retrofit initiatives, along with new programs for agriculture customers, small businesses and customer-owned small renewable resources.
- In 2008, the Iowa General Assembly passed legislation that required the Iowa Municipal Utilities to assess their cost-effective energy efficiency potential and establish energy efficiency goals.
  - From 2007 to 2009, 22 municipal electric utilities increased their energy efficiency spending from $2,320,330 to $3,357,238 for an increase of 45% and increased their energy savings from 4,286,147 kWh to 12,506,305 kWh, an increase of 192%.
  - Seven municipal gas utilities increased energy efficiency spending from $317,282 in 2007 to $604,148 in 2009, or an increase of 90% and between 2008 and 2009 increased natural gas savings from 87,144 therms to 114,920 therms, or 32%.
- The Iowa Association of Electric Cooperatives, on behalf of their members, filed a joint five year energy efficiency plan covering the years 2010 – 2014. Over the 5 year plan the cooperatives expect to invest over $71 million dollars in energy efficiency programs for a lifetime savings of more than 4.2 billion kilowatt hours. The 4.2 billion kilowatt-hours represents enough electricity to power more than 350,000 homes (or nearly 30 percent of the homes in Iowa) with electricity for a full year.
- Iowa ranks 12th in the nation for its efforts to promote energy efficiency in the state (American Council for an Energy Efficient Economy).
- Iowa ranks 8th-best in the country for state government initiatives because of Executive Order 6 enacting Green Government Initiatives (ACEEE).
- Iowa is one of only 15 states having both energy efficiency standards for state buildings and energy efficiency monitoring of those state buildings (ACEEE).
- Iowa is one of only 17 states with a state-wide code that meets or exceeds the latest International Energy Conservation Code standards for both residential and commercial buildings (ACEEE).
- American Recovery and Reinvestment Act investments of approximately $53 million have leveraged over $67.6 million in matching funds for projects focused on implementing energy efficiency and renewable energy. The projects will create more than 860 jobs, add 4.5 MW of renewable electricity to Iowa's electric supply network and generate annual savings of over $10 million.
- The Office established an $8.5 million revolving loan fund that provides low interest financing for energy projects to home owners, commercial property owners, industries, public sector entities and others in the state.
- The U.S. Department of Agriculture offers Rural Energy for America Program (REAP) grants for renewable energy and energy efficiency for farmers, ranchers and rural small businesses. The grants are awarded on a competitive basis and can be up to 25% of total eligible project costs. Grants are limited to $250,000 for energy efficiency improvements and requests as low as $1,500 will be considered. At least 20% of the grant funds must be for grants of $20,000 or less. In 2010, over $8.6 million was granted for replacing and upgrading energy efficient grain dryers. ■

NUCLEAR ENERGY IN IOWA AND NATIONALLY

The federal Energy Policy Act of 2005 provided financial incentives for the construction of advanced nuclear plants with incentives including a 2.1 cents/kWh tax credit for the first 6,000 MWe of capacity in the first eight years of operation, and federal loan guarantees for the project cost. To date the U.S. Department of Energy (DOE) has received over $122 billion in requests and authorized funding for $18.5 billion.

The DOE has also allowed companies to apply for combined construction and operating licenses (COL) for new nuclear power plants, with costs being shared by DOE. COL applications for 26 new nuclear reactors at 17 sites had been submitted to the Nuclear Regulatory Commission (NRC) by mid-2009. The NRC expects applications for a further seven reactors this year. (World Nuclear Association)

In Iowa, nuclear energy contributes nearly five percent of Iowa's total electric capacity. Although nuclear energy makes up a small portion of Iowa's energy consumption, its use has grown by 68% since 1980. A single nuclear power plant is located in Iowa, Duane Arnold Energy Center, just north of Cedar Rapids in Palo. The plant produces enough electricity to supply the annual needs of more than 600,000 homes. Iowa also receives additional nuclear energy from a plant located in Cordova, Illinois. The Cordova plant has two reactors that can generate enough electricity to power more than 1.5 million average American homes.

In 2010, the Iowa Legislature passed a bill to allow MidAmerican Energy to recover some of the cost of conducting a study on the nuclear energy potential in Iowa. The study will examine the alteration of existing generation facilities such as switching coal plants to natural gas, and the construction of significant high-voltage transmission. The study will help MidAmerican determine if there are potential sites in Iowa, the potential size and related economics of a new nuclear power plant.

No matter the result of the analysis, it remains clear that Iowans must rely on a portfolio of energy sources to power our homes and businesses. The Office will educate consumers about the considerations of price, security, economy and the environmental regulations that impact energy fuel source decisions. Nuclear energy will continue to be part of the discussion. ■

FULLY DEVELOP IOWA'S RENEWABLE ENERGY POTENTIAL

TARGET: INCREASE WIND GENERATION IN IOWA TO 10,000MW OR MORE BY 2025

Iowa is abundant in renewable energy resources, one of which is wind. Sitting in a region that has been dubbed "the Saudi Arabia of Wind," Iowa has established itself as a national leader and innovator in wind power. Wind energy is one of the cleanest energy sources in the world today. It has pumped millions of dollars and thousands of jobs into Iowa's economy and provided a homegrown energy source that has helped diversify the nation's energy supplies and reduce reliance on foreign fossil fuels.

Iowa currently ranks second in the nation in wind-produced electricity with 3,670 megawatts installed and approximately 2,500 turbines statewide. Iowa's aggressive pursuit of wind energy has translated to more than $50 million in new revenue every year for Iowa companies supplying the wind industry and 2,300 jobs committed to wind manufacturing, the most in the nation.

Yet wind's true potential in Iowa remains untapped. According to the National Renewable Energy Laboratory (NREL), more than three-quarters of Iowa has high enough wind speeds 80 meters above ground, making our state suitable for wind power development ("Think Wind Power, 'Think Iowa'," The Iowa Policy Project, March 2010). NREL also found that the state has the maximum technical potential to install 570,714 megawatts. That may be a lofty ambition for now. But the Office of Energy Independence is taking a major step in developing Iowa's renewable energy potential with its goal of increasing wind generation in the state to 10,000 megawatts.

The installation and operation of these additional wind turbines would translate to approximately $30 million annually in property lease payments—up from currently $10 million a year—to Iowa landowners and $15 billion in total taxable value. Increased wind capacity would also mean the need for more operation and maintenance workers. Some $38.54 million in annual gross earnings would be generated from operation and maintenance jobs (Iowa Wind Energy Association).

Statistics show that the wind industry has been a burgeoning area in the clean energy economy. Wind power jobs grew 23.5 percent from 1998 to 2007, outpacing solar jobs, which grew 19.1 percent in the same time period ("The Clean Energy Economy: Repowering Jobs, Businesses and Investments Across America," The Pew Charitable Trusts, June 2009). The number of wind energy patents also climbed 155 percent from 1999 to 2008. More broadly, the area of clean energy is seeing a lot of interest in Iowa, bringing in almost $150 million in venture capital into the state, with 46 clean energy technology patents registered from 1999 to 2008.

Investing in wind power also means bypassing the fuel costs associated with coal- and gas-fired electricity, which have prices that can often be volatile and unpredictable ("20% Wind Energy by 2030," Department of Energy, July 2008). Iowa, which is currently 75 percent dependent on coal, may also be heavily impacted by the passage of carbon-limiting policies. Such a policy may mean higher electricity prices for generators and consumers, making alternatives like wind more economical (Navigant Consulting study to the Iowa Office of Energy Independence, January 2009).

If Iowa stays the course and continues to increase its production of wind power, the environmental impacts could be substantial, including a reduction in greenhouse gases such as carbon dioxide (CO2) and an increase in water savings.

Producing electricity from wind also avoids other negative environmental impacts that are associated with the use of fossil fuels, including emissions of heavy metals, production of toxic wastes and acid rain. Particulate matter and emissions associated with power plants have been linked to health issues including cardiovascular problems and neurological development issues in children ("20% Wind Energy by 2030," Department of Energy, July 2008).

The U.S. annually emits about 6,000 million metric tons of CO2 ("20% Wind Energy by 2030," Department of Energy, July 2008). By 2030, that amount is expected to rise to almost 7,900 million metric tons, with approximately 40 percent attributed to the electric power sector. Under the federal government's goal of generating 20 percent of the country's electricity from wind by 2030, annual CO2 emissions in the electric sector could be reduced by 825 million metric tons by 2030.

In fact, a single 1.5 megawatt wind turbine avoids the emission of 2,700 metric tons of CO2 every year, which is equivalent to planting 4 square kilometers of forest every year (American Wind Energy Association, 2007).

Electricity-generating sources like fossil and nuclear fuels use large amounts of water for cooling; wind turbines don't consume water (U.S. Department of Energy, Energy Efficiency and Renewable Energy). Under the federal government's goal of 20 percent wind energy plan, water consumption in the electric sector would potentially be reduced by 8 percent, or four trillion gallons, from 2007 to 2030. Of that four trillion gallons, 41 percent will be in Iowa and the Midwest/Great Plains ("Renewable Energy and Economic Potential in Iowa, Kansas, Nebraska, South Dakota," Center for Rural Affairs, August 2009).

The goal to reach 10+ GW of wind power by 2025 is not without obstacles. Iowa must add at least 6,330 GW of wind turbine capacity. Presently it is estimated that 1 to 2 GW of additional capacity can be added with only a nominal investment in transmission. According to the U.S. DOE, transmission limitations are the greatest obstacle to realizing the economic, environmental and energy security benefits available from wind. In fact, across the nation lack of transmission capacity is holding up economic development. Over 300,000 MW of wind projects across the U.S. are on hold, and concerns of adequate transmission nationwide are shared by solar, geothermal and hydropower industries. In Iowa, 56% of major transmission lines are over 35

years old. Clearly, work is needed to develop plans for adding electrical transmission capacity.

Iowa is working at several different levels to address these needs. At the state level, Iowa is participating in the Upper Midwest Transmission Development Initiative (UMTDI). This is a governor's level initiative between 5 states: Iowa, Minnesota, North Dakota, South Dakota, and Wisconsin. The primary focus of this initiative is to collaborate with other transmission studies and owners to promote economic development, grid reliability and access to and transport of renewable sources from source to load.

At the regional level, Iowa is participating in both the Eastern Interconnection States' Planning Council and the Eastern Interconnection Planning Collaborative, known respectively as EISPC and EIPC. The Eastern Interconnection refers to one of the two major alternating current (AC) power grids in North America, and the area served reaches from Central Canada Eastward to the Atlantic coast (excluding Québec), South to Florida and West to the foot of the Rockies (excluding most of Texas). Both EISPC and EIPC were awarded funding through the U.S. DOE for the purpose of working collaboratively to develop a portfolio of long-term electricity supply futures, estimating the associated transmission requirements and preparing long-term interconnection-wide transmission plans.

Finally, at the national level, Iowa participates in the Governors' Wind Energy Coalition (GWC). Iowa is a founding member of the Coalition, joining in 2008, and in 2010 Governor Chet Culver has served as Chair for the Coalition alongside vice-chair Rhode Island Governor Donald L. Carcieri. The GWC is a bipartisan effort to meet America's domestic energy demands in an environmentally responsible manner, reduce the nation's dependence on imported energy sources and stimulate state and national economic development. Twenty-six states are represented across the continental U.S., including Hawaii. ■

KEY RECOMMENDATIONS FOR 2011

ADVOCATE FOR A POLICY THAT SEEKS TO FAIRLY ALLOCATE COSTS OF TRANSMISSION DEVELOPMENT TO THOSE WHO BENEFIT FROM THE DEVELOPMENT.

- Work with Governors around the country to support the proposal.
- Work with key stakeholders to provide consumer education on issues related to transmission.
- Collaborate with the Upper Midwest Transmission Development Initiative and Eastern Interconnection States' Planning Council.
- Partner with utilities to produce an informational insert and/or web site information for consumers on transmission issues.

ACTIVELY ENDORSE A FEDERAL RENEWABLE ELECTRICITY STANDARD.

- Support an emphasis on distributed generation.

SUPPORT RENEWAL OF THE FEDERAL PRODUCTION TAX CREDIT AND CLEAN RENEWABLE ENERGY BONDS.

"We are really pleased with the progress we have made on this project. Amana Farms has digested approximately 81 million pounds and 13 million gallons of waste products to date to produce biogas. We've also sold 7,620,000 kWh to the Amana Society Service Company."

-John McGrath
Farm Manager of Amana Farms, Inc.

POWER FUND CASE STUDY

AMANA FARMS *ELECTRICITY*

Amana Farms Turns Manure Into Electricity

AMANA FARMS PROJECT
Amana Farms Turns Manure Into Electricity

Bioenergy is stored energy from the sun contained in materials such as plant matter and animal waste, known as biomass. The wide variety of biomass fuel sources includes agricultural residue, pulp/paper mill residue, urban wood waste, forest residue, energy crops, landfill methane, and animal waste. Energy in the form of electricity, heat, steam, and fuels can be derived from these sources through conversion methods such as direct combustion boiler and steam turbines, anaerobic digestion, co-firing, gasification, and pyrolysis.

The Iowa Power Fund investment totaling $1,082,575 leverages resources totaling $4,077,449 from Amana Farms, Inc., to implement technology that utilizes waste products, such as manure, food processing by-products, or organic industrial by-products, to produce methane gas for electricity. The technology also will be used to produce a solid soil enhancer and liquid nitrogen to replace chemically-produced fertilizers in the farming cycle.

Amana Farms, Inc., is one of the largest farming and cattle operations in the state of Iowa. Waste management and innovative and effective approaches for waste disposal are a primary concern to the cattle operation that grazes 4,000 head of cattle on 26,000 acres of land. The Farm to Fuel project will utilize anaerobic digestion to break down the biodegradable material found in animal waste and organic waste materials left from the processing of grains into commercial products, which are combined and fed into a sealed reactor. After reaching high heat temperatures, microorganisms break down the biodegradable material in the organic wastes and ultimately create methane-rich biogas, which can be used to produce energy. The remaining solid waste material can be used as compost and liquid nitrogen.

Amana Farms will deploy the largest two-stage continuous-feed digester in the state, which will consume 10,700 cubic feet of waste a day. The digester will use 2,200 cubic feet of manure from the Amana Farms' operations and 8,500 cubic feet of food processing by-product obtained from regional processors.

This project creates significant environmental benefits for Iowa by removing animal waste and organic industrial by-products from the waste stream, and eases pressures of regional systems. It also removes odor and pathogens from fertilizers, making the nutrients more "crop available" and efficient, and has a lower impact on area water systems.

Essentially, this project eliminates waste and utilizes it to create bioenergy. While electricity generated from biogas is not a new concept, it is just recently becoming economical for livestock producers. The methane captured will be burned by Amana Farms on-site to produce electricity. The electricity not utilized by the farm operation will be sold to the local utility service provider and put on the local grid. About 1.4 million kWh is expected to be generated each month and sold to the local utility company at a price that is 2 – 4 cents lower than projected power costs from other sources. This creates economic benefits to local consumers by generating savings of $336,000 - $672,000 annually, which is shared with all of the utility company's customers. Amana Farms will use the solid soil enhancer locally for crop production and the liquid nitrogen as fertilizer.

Recycling waste produces economic and environmental improvements that will benefit Iowans today, as well as into the future. This Iowa Power Fund project creates a renewable, sustainable energy resource, reduces greenhouse gas emissions by recycling waste into bioenergy, and will reduce Iowa's reliance on fossil fuel. If successful, this business model can be replicated by other farming operations and municipal groups, which can create an even greater impact for Iowa and the nation. ■

SOLAR IN IOWA

Solar space heating has been used for generations by orienting building structures to best utilize solar heat gain. Solar hot water is one of the most cost-effective solar technologies on the market. It's a viable option for homes, pools and commercial buildings (Iowa Energy Center). With federal tax incentives and a base of qualified installers, solar water heating is a technology that every homeowner can use to save dollars on utility bills (Florida Solar Energy Center).

Continued advances in Photovoltaic (PV) technology, combined with federal incentives and utility rebates, is helping drive down the cost of this solar technology in parts of Iowa. With these new incentives there has been a noticeable increase in PV panels being installed across the state. Recently, Alliant Energy instituted a new rebate program specifically for PV systems. With rebates, the assistance of Iowa's net metering law, the Alternate Energy Revolving Loan Program and other tax incentives, PV has the potential to expand rapidly in Iowa over the next several years.

Solar energy technology is on the horizon with the assistance of the Iowa Power Fund. Iowa State University is contributing to the global research efforts of improving the efficiencies and cost effectiveness of photovoltaic panels. With their contributions, Iowa is uniquely positioned to benefit from the next generation of PV panels. Iowa State University researchers also are producing thin film solar cells that have the potential to make solar energy even more cost competitive in the near future. Additionally, researchers at the University of Northern Iowa are developing a cheaper solar cell based on dye sensitized solar cell technology.

The Office will continue to work with stakeholders to ensure the continuation and development of favorable policies and incentives for Iowans to install solar and other renewable energy systems. Iowa also has several policies and incentives to allow individual consumers to install solar systems and other renewable energy systems.

- Iowa's net metering rule, adopted by the Iowa Utilities Board in July 1984, applies to customers of Iowa's two investor-owned utilities, MidAmerican Energy and Alliant Energy – Interstate Power and Light (IPL). Net metering requires utility company to compensate the renewable energy owning system consumer for the electricity fed back onto the grid when the consumer's system is producing electricity and it is not used by the consumer, subject to system limits of 500 kW. Excess power generation is credited to future power bills.
- The Alternate Energy Revolving Loan Program (AERLP) is administered by the Iowa Energy Center and funded through ratepayer contributions from the state's utilities. In partnership with Iowa banks, the AERLP provides loan funds to individuals and organizations who build renewable energy production facilities in Iowa.
- In 2005, renewable energy production tax credits were made available for businesses, schools, rural electric co-ops and agriculture. Maximum incentives of 1.5 cents/kWh are available for ten years after the facility begins producing and selling energy. A similar bill enacted at the same time provided residential homeowners tax credits for producing electricity with solar as well.
- Solar electric systems in Iowa are property tax exempt and sales tax exempt.
- Alliant Energy offers rebates for renewable energy systems through their ratepayer funded energy efficiency programs.
- The U.S. Department of Agriculture offers Rural Energy for America Program (REAP) grants for renewable energy and energy efficiency for farmers, ranchers and rural small businesses. The grants are awarded on a competitive basis and can be up to 25% of total eligible project costs. Grants are limited to $500,000 for renewable energy systems and requests as low as $2,500 will be considered. At least 20% of the grant funds awarded must be for grants of $20,000 or less. ■

MAXIMIZE THE DEVELOPMENT AND USE OF ECONOMICALLY AND ENVIRONMENTALLY SUSTAINABLE BIOFUELS AND BIOCHEMICALS

TARGET: INCREASE IOWA'S AND THE NATION'S USE OF BIOFUELS BY 50% BY 2025

Today, more than half of the oil used in the U.S. is imported, and the country's dependence is expected to increase as our domestic resources are depleted. The majority of the world's oil reserves are located in the Middle East, with approximately two-thirds controlled by members of the Organization of the Petroleum Exporting Countries (OPEC). America's economy has paid a price—about $1.9 trillion from 2004 to 2008—because of our dependency on foreign oil.

The economic and national security ramifications of our continued dependence on foreign oil cannot be ignored. One solution to reducing the amount of imported oil is the continued development and commercialization of biofuels, including ethanol and biodiesel.

Iowa is playing a key role in this effort as the national leader in biofuels output, producing nearly 30 percent of U.S. ethanol and 15 percent of biodiesel. To ensure that biofuels continue to be a cost-effective and environmentally sound solution for our energy needs today and in the future, a goal of the Office of Energy Independence is to maximize the development and commercialization of economically and environmentally sustainable low carbon fuel technologies in Iowa. Accomplishment of this will require coordination between industry and government and education of consumers in Iowa and nationwide.

Biofuels and biochemicals create jobs and offer business opportunities for farmers to help reduce harmful emissions. Ethanol and biodiesel account for $11.5 billion—or 8% —of Iowa's Gross Domestic Product. In addition, they generate $2.3 billion in income for Iowa households, support more than 70,000 jobs throughout the economy (or 4.6 percent of private, nonfarm employment) and create $532 million in state tax revenue (Iowa Renewable Fuels Association).

Nationwide, the U.S. ethanol industry helped support nearly 400,000 jobs in 2009, according to the Renewable Fuels Association. Ethanol also contributed $53.3 billion to the Gross Domestic Product and added $16 billion to household income. It also displaced the need for 364 million barrels of oil.

Iowa corn farmers earn additional revenue because of Iowa's ethanol industry, which uses more than one billion bushels of corn, or about 46 percent of the state's corn crop (Iowa Renewable Fuels Association). Using 2009 prices, this is equivalent to nearly $2.8 billion in revenue for corn growers.

The state's biodiesel industry, while not as robust as ethanol, also has the potential for significant impact. An increase in soybean commodity prices, coupled with a weak demand for motor fuel and the recession, has severely affected the industry. According to the Iowa Renewable Fuels Association, only nine of Iowa's 15 biodiesel plants were operating at the end of 2009, producing approximately 85 million gallons; much lower than the 322 million gallons they could produce at full capacity. Continued underutilization of the industry translates to a $1.4 billion lower Iowa's Gross State Product than if plants were operating at full capacity, and loss of $304 million in employee salaries and wages. It also means 8,600 fewer jobs across all sectors of the state's economy and a decline in tax revenues by almost $66 million (Iowa Renewable Fuels Association).

Biofuels reduce tailpipe emissions. Compared with conventional gasoline, grain-based ethanol reduces a number of pollutants, including greenhouse gas emissions (35 to 46 percent), smog-forming emissions (25 percent), tailpipe carbon monoxide (by as much as 30 percent), exhaust VOC emissions (12 percent), toxic emissions (30 percent) and particulate emissions (Renewable Fuels Association and the Iowa Corn Promotion Board).

In 2009, 124.3 million gallons of ethanol were used in Iowa, decreasing emissions from vehicles by more than 193,000 metric tons—the equivalent of removing nearly 32,000 vehicles from the road (Iowa Renewable Fuels Association). Nationally, the use of 10.6 billion gallons of ethanol reduced emissions from vehicles by 16.5 million metric tons, or equal to taking 2.7 million vehicles off the road ("2010 Ethanol Industry Outlook," Renewable Fuels Association).

Biodiesel yields a 78 percent reduction in direct lifecycle CO2 emissions compared to petroleum diesel fuel, according to a lifecycle study from the U.S. Department of Agriculture/Department of Energy (Testimony by Manning Feraci, National Biodiesel Board Vice President of Federal Affairs, before the U.S. House Committee on Small Business, Sept. 30, 2009). One billion gallons of biodiesel will reduce the current lifecycle greenhouse gas emissions by 16.12 billion pounds, similar to pulling 1.4 million passenger vehicles from U.S. roads.

Iowa's use of 7.5 million gallons of biodiesel in 2009 displaced more than 414,000 barrels of petroleum. Biodiesel's contribution that year to reducing pollution was equivalent to removing 10,650 passenger vehicles from the roadways (Iowa Renewable Fuels Association). In 2008, the U.S. produced 690 million gallons of biodiesel, which replaced 38.1 million barrels of petroleum. The amount of emissions reduced was equivalent to 980,000 passenger vehicles being removed from America's roads (Testimony by Manning Feraci, National Biodiesel Board Vice President of Federal Affairs, before the U.S. House Committee on Small Business, Sept. 30, 2009).

Magellan Midstream Partners and POET have been studying the feasibility of a long distance renewable fuel pipeline originating in South Dakota and passing through Iowa, Minnesota, Illinois, Indiana, Ohio, Pennsylvania and New Jersey. Because of increased ethanol demand created by the federal renewable fuels standard, the construction of a dedicated renewable pipeline capable of transporting up to 240,000 barrels per day of ethanol from the production base in the Midwest to markets in the east coast may become a reality under certain conditions. If constructed, the pipeline would be connected to multiple ethanol production plants throughout Iowa and the Midwest. In addition, five "aggregation tank farms" would be constructed in the Midwest to accommodate ethanol deliveries by truck which would be loaded into the pipeline. Over 600 miles of new pipeline would be constructed in Iowa creating many new jobs.

Federal financing is necessary for this project. Magellan and POET are continuing to work with the U.S. Department of Energy, the Iowa Congressional delegation and other members of Congress to promote a legislative initiative which would provide an opportunity for a dedicated renewable pipeline to qualify for a loan guarantee.

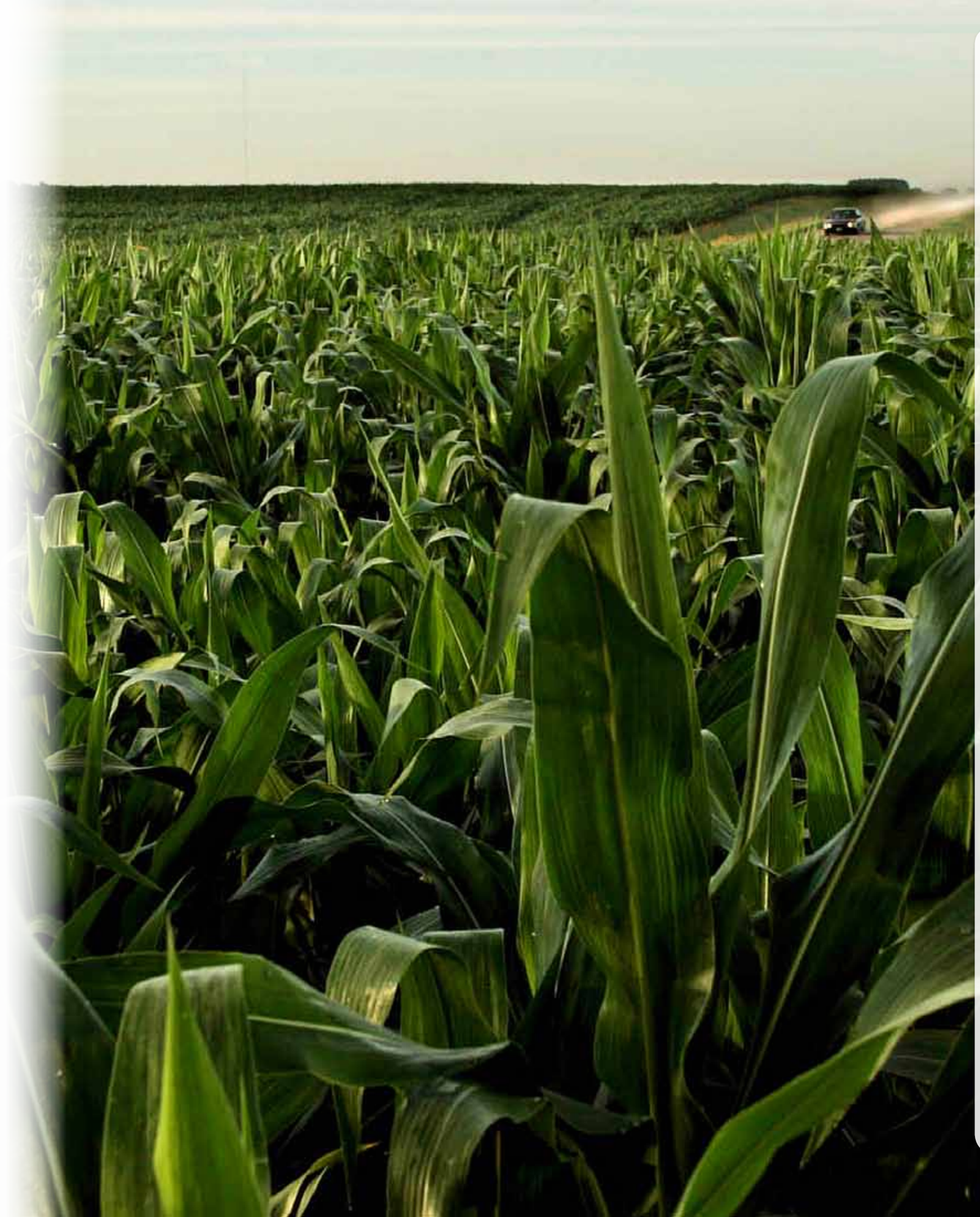
The Office will continue to encourage a ruling from US EPA that permits the use of E15 in all vehicles, and support strategies to provide consumers with access to more cost-effective, homegrown, and environmentally sound fuel through legislation such as the "Consumer Fuels and Vehicle Choice Act" (Act). Sponsored by Sens. Harkin (D-IA) and Lugar (R-IN), the Act would provide for more Flexible Fuel Vehicles (FFVs) and blender pumps which dispense ethanol-gasoline blends at various percentages at the retail level. Advances in technology have reduced the manufacturing cost of producing flex fuel vehicles (FFV) making it economically feasible to produce all new vehicles in the U.S. as "dual fueled" or flex fuel. With all new vehicles sold in the U.S. being FFV, this will allow an increase

in the use of biofuels, give consumers new fueling choices at the pump and provide a choice to take action steps toward energy independence.

In addition to directly displacing petroleum-based transportation fuels with biofuels, Iowa's bioenergy industry is also uniquely positioned to move Iowa toward energy independence by developing more biochemicals. The Iowa Power Fund has invested in bolt-on technologies that can be deployed to existing ethanol or biodiesel plants. Such technologies also improve the economic viability of biofuels plants by creating high value chemicals that can be used to produce rubber for tires, or as building blocks for animal feeds, or as ingredients in health and beauty products. When efforts to produce bio-ammonia succeed, Iowa will move closer to energy independence by being able to produce ammonia from biomass instead of using natural gas imported from other states or other nations. Displacing fossil fuel imported to Iowa also has the benefit of keeping money in Iowa's economy instead of letting it flow out of state.

To transition to a more sustainable biofuels future, the Iowa Power Fund has funded several second generation ethanol technologies that will use cellulosic materials instead of corn as feedstock. For example, POET's Project Liberty is transforming their traditional ethanol biorefinery in Emmetsburg, Iowa, into an integrated corn-to-ethanol and cellulose-to-ethanol biorefinery that will use corn cobs and similar biomass as feedstock to produce 25 million gallons of cellulosic ethanol annually. Easy Energy Systems, LLC is researching the design and installation of a modular cellulosic ethanol production system for easier adoption and less onsite construction.

Whether or not the U.S. can totally eliminate its need to import oil remains to be seen. However, the continued development and increased use of biofuels in Iowa and nationwide will certainly reduce the demand for foreign oil and move the state of Iowa and the nation toward greater energy independence. ■



KEY RECOMMENDATIONS FOR 2011

ENDORSE FEDERAL POLICIES THAT SUPPORT BIOFUELS PRODUCTION AND CONSUMPTION INCLUDING, BUT NOT LIMITED TO, THE CONSUMER FUELS AND VEHICLE CHOICE ACT, ENCOURAGE RULINGS BY EPA ALLOWING THE USE OF E15 IN ALL VEHICLES AND THE RENEWAL OF THE ETHANOL AND BIODIESEL TAX CREDIT.

- Collaborate with the Iowa congressional delegation and both Iowa and national trade organizations in these advocacy efforts

SUPPORT THE INSTALLATION OF BLENDER PUMPS AT RETAIL LOCATIONS IN HIGH INTENSITY TRAFFIC AREAS IN IOWA TO INCREASE THE USE OF E15 AND E85.

- Dramatically increase the availability of biofuels for consumers in Iowa and around the nation.
- Recommend funding to provide additional incentives for blender pump installation and consumer education.

CONDUCT MORE CONSUMER EDUCATION ABOUT PURCHASING FLEX FUEL VEHICLES AND ENCOURAGE OWNERS OF FLEX FUEL VEHICLES TO USE HIGHER BLENDS OF ETHANOL.

- Partner with groups including the Iowa Renewable Fuels Association, Iowa Soybean Association and Iowa Corn Growers Association to provide consumer education.
- Establish a consumer-friendly website that answers consumer questions about flex fuel vehicles and high blend ethanol.
- Coordinate with associations and retailers to have point of sale information about flex fuel vehicles
- Work with auto dealers to provide and disseminate informational materials to consumers regarding flex fuel vehicles.
- Encourage all new vehicles sold in this country to be flex fuel vehicles.

SUPPORT THE USE OF HIGHER BLENDS OF BIODIESEL.

POWER FUND CASE STUDY

GREEN PLAINS
RENEWABLE ENERGY
Producing Biodiesel from Algae

GREEN PLAINS RENEWABLE ENERGY PROJECT
BIOPROCESS ALGAE
Producing Biodiesel from Algae

Iowa leads the nation in biofuels output, accounting for 26% of U.S. ethanol and 12% of biodiesel production capacity. Biofuels are produced from recently living organisms that can be harvested and easily grown again and again. First-generation biofuels are made largely from edible sugars and starches. Second-generation are made from non-edible plant materials, and third-generation biofuels are made from algae and microbes. First-generation biofuels are primarily blended into ethanol. In the U.S. alone, approximately 70% of the gasoline sold contains ethanol.

Second- and third-generation biofuels, commonly referred to as advanced biofuels, could play an important role in diversifying the world's energy sources and curbing greenhouse gas emissions. Advanced biofuels offer environmental benefits such as lower carbon emissions and lower sulfur compared with petroleum-based fuels.

The Iowa biodiesel industry currently uses about 353 million pounds of soybean oil, 218 million pounds of other fats and oils, and 71 million pounds of corn oil. While the increase in corn and soybean crop prices is good for Iowa farmers, it impacts the cost to produce biodiesel.

A U.S. governmental mandate to increase biodiesel usage from 500 million gallons in 2009 to one billion gallons in 2012 means the research and development of less expensive feedstock sources is needed. Currently, more than 80% of biodiesel production costs result from the cost of the feedstock used to produce the biodiesel. The biodiesel industry is relatively new and comes with challenges such as scalability, because tens of millions of tons of biomass are required annually to produce enough fuel to make a difference; the sustainability concerning environmental and socioeconomic issues of land and biomass use; and cost relative to scaling up the technology to full production.

Producing biodiesel from algae and other biomass feedstock promises to greatly increase the volume of biodiesel produced. According to a report issued by the U.S. Department of Energy and Department of Agriculture, land resources in the U.S. are capable of producing a sustainable supply of 1.3 billion tons per year of biomass and 1 billion tons of biomass would be sufficient to displace 30% or more of the country's present petroleum consumption.

Building upon the strong grain-based technology, the biodiesel industry is rapidly developing and expanding the types of feedstock available for biodiesel production. The Iowa Power Fund (IPF) has invested in projects that advance new technology to maintain Iowa's renewable energy leadership role. The Green Plains Renewable Energy Bioprocess Algae project capitalizes on Iowa's rich soil and advanced technology to develop an alternative to oil-based diesel. The IPF investment totaling $2,085,000 leverages other resources of the same amount to create an alternative diesel feedstock from algae.

The Green Plains Renewable Energy Bioprocess Algae project will advance technology that utilizes waste products from the ethanol plant in Shenandoah, Iowa, such as carbon dioxide, wastewater, nutrients, sunlight, and waste heat to produce algae oil, algae meal and dry whole algae. "This provides a whole new avenue to produce oils and proteins," said Gregg

Connell, Executive Vice President of the Shenandoah Chamber and Industry Association. The various forms of algae will be used as biodiesel feedstock and animal feed additives.

The advanced system used in this process eliminates the emission of greenhouse gases into the environment by capturing waste carbon dioxide and using it to produce the mass amounts of algae. While creating long-term, cleaner air environmental benefits, the 50 million gallon a year ethanol plant will also produce 3 million gallons of biodiesel and 24,000 tons of high-protein meal products annually.

This project was successful in proving that algae are a viable feedstock for the production of biodiesel. The Shenandoah pilot plant produced daily harvests that exceeded expectations. This project has overcome many of the industry challenges. Recycling waste produced from the existing ethanol plant eliminated greenhouse gas emissions, while producing a cost-effective, sustainable biodiesel feedstock. After evaluating and making minor changes that resulted from Phase 1 testing, officials will be able to improve productivity, volume, and bioreactor performance as they move into Phase 2, which involves commercialization of algae production. The full commercial scale facility will put Iowa on the map for establishing the first of its kind in the U.S. "When algae become a huger player in the biodiesel and animal protein market, it will be because the Iowa Power Fund allowed us to dream," stated Connell.

A study prepared for the Iowa Renewable Fuels Association indicates that the Iowa biodiesel industry has added nearly $471 million to Iowa's Gross Domestic Product, generated $103 million in household income, and generated $22 million in state tax revenue. An emerging industry, Iowa biodiesel production supports more than 2,900 permanent jobs throughout Iowa. Developing new technologies and feedstock that maximize the value of crops will secure Iowa's economic prosperity into the future.

The Iowa Power Fund has invested in projects that create an immediate economic stimulus to put Iowans to work while establishing Iowa as the renewable energy capital of the world. Solutions to the global energy crisis can only be obtained from solid research, development, and commercialization of renewable energy and energy efficiency technologies. This project will diversify Iowa's ability to produce biodiesel and other renewable energy resources, reduce dependency on petroleum gas or coal, and maintain a leadership role in renewable energy. ■

TARGET: REDUCE GREENHOUSE GAS INTENSITY IN TRANSPORTATION FUELS

Development of a Low Carbon Fuel Standard (LCFS) is an approach that is being considered in California and some states in the northeast as well as by U.S. EPA to reduce the greenhouse gas emissions of transportation fuels. While called a low carbon fuel, it technically refers to fuels that have lower greenhouse gas emissions during its entire life cycle -- from producing it, moving it, through using it. Any low carbon fuel standard should be fuel neutral, established with scientifically proven methodology, and consider all inputs, outputs, and emissions.

Biofuels are naturally grown fuels. As biofuels and technology have improved over the past 30 years, these fuels have achieved production efficiencies that allow them to be produced with lower life cycle carbon emissions than fossil fuels.

Iowa currently ranks first in the nation in biofuels production, manufacturing primarily corn-based ethanol. The contribution of biofuels to the state's economy has been significant, adding $11.5 billion to Iowa's Gross State Product in 2009.

The biofuels industry has achieved significant progress through development of new technologies that reduce environmental impacts. Survey data from the U.S. Department of Energy's Argonne National Laboratory found that from 2001 to 2006, the industry was using 15.7 percent less electricity; total energy use, on the whole, was down 21.8 percent. A similar survey done by consulting firm Christianson and Associates found that total energy and electricity use at dry mills decreased by 13 percent.

Water use in ethanol production has decreased significantly. According to the CFDC, it takes approximately 3.5 gallons of water to produce 1 gallon of ethanol. Much of that is processed and returned to streams and watersheds. However, newer dry mill ethanol plants, including most of Iowa's current plants, average less than 3 gallons of water per gallon of ethanol produced. At one time, it took 8 gallons of water to produce 1 gallon of ethanol, so the industry is continually getting better at managing this resource. To put ethanol's water use in perspective, a 100 million gallon per year ethanol plant uses as much water as it takes to irrigate 1,000 typical residential lawns over the spring/summer season.

Beyond discussions of environmental impacts, there have also been discussions of the impact biofuels have on food price and supply. According to the World Bank Report from July 2010, the price of oil and other fossil fuels and market speculation were the primary factors driving increased food prices in 2008 and not ethanol demand for corn. Corn growers have significantly increased corn production over the past two decades and have more than met the increased corn demand for fuel ethanol. Corn yields and production per acre are expected to continue to increase due to continued advancement of seed technology and sustainable tillage practices, providing ample supply for both food and fuel uses in the future.

Ethanol is produced from field corn fed to livestock, not sweet corn fed to humans. Importantly, ethanol production utilizes only the starch portion of the corn kernel, which is abundant and of low value. The remaining vitamins, minerals, protein and fiber are sold as high-value livestock feed. (Renewable Fuels Association)

With investments through the Iowa Power Fund, an increasing amount of ethanol is produced from nontraditional feedstocks such as waste products from the beverage, food and forestry industries. In the very near future we will also produce ethanol from agricultural residues such as corn stover, municipal solid waste and energy crops such as switchgrass.

Biofuels compare favorably with petroleum based transportation fuels regarding the amount of energy consumed in production. There are differing analyses regarding the efficiency of ethanol production; however, most credible examinations show that ethanol is a more efficient fuel to produce than gasoline.

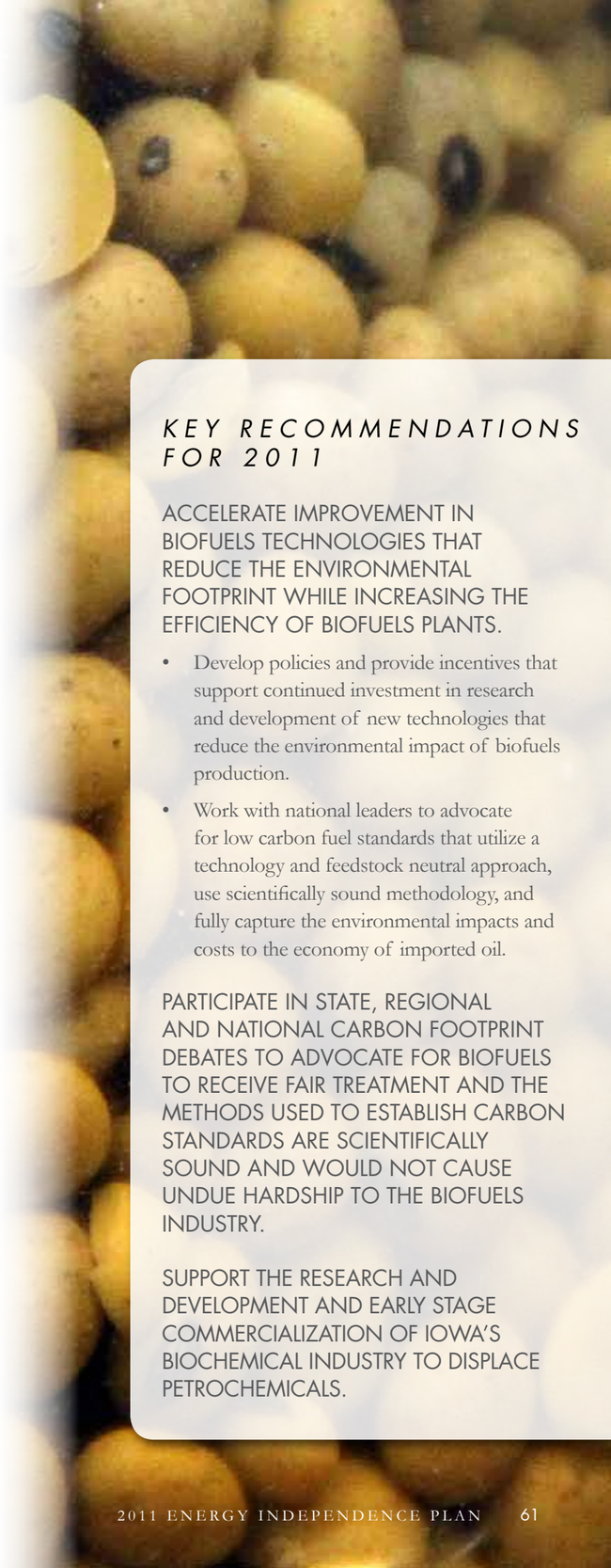
According to the Clean Fuels Development Coalition for every unit of energy dedicated to the production of gasoline, there is a 19.5 percent energy loss. Conversely, studies (such as the 2010 USDA study titled 2008 Energy Balance for the Corn-Ethanol Industry) have found that after taking into consideration the energy required to grow, harvest and transport corn to the ethanol plant, corn-ethanol has an energy ratio of 1.4 even without consideration for by-products credits. A 40% net gain is achieved through the reduced energy consumption in processing and the use of solar energy that is stored in crops.

There are a number of state, national and international policies reflecting goals to significantly reduce the environmental footprint of transportation fuels overall, including biofuels. They include California's low-carbon fuel standards, the federal Renewable Fuels Standard and the Midwest Governors Association's low-carbon fuels policy recommendations (with a goal of 10 percent reduction in carbon intensity of transportation fuels in 10 years).

To ensure the long term economic and environmental sustainability of the biofuels industry, the Office will work with legislators, other state agencies, and the industry to encourage and incent the continued development and commercialization of technologies that improve the productivity, profitability and capability of the industry.

The Office will actively engage in discussions with all federal agencies and other stakeholders to advocate for LCFS that are scientifically sound in methodology and economically fair to the biofuels industry.

Iowa will remain at the forefront of the biofuels industry by continuing work with the industry to improve the technology and reduce the environmental impact of first-generation biofuels, as well as promote the development and commercialization of second-generation fuels such as ethanol from biomass and other advanced biofuels. ■



KEY RECOMMENDATIONS FOR 2011

ACCELERATE IMPROVEMENT IN BIOFUELS TECHNOLOGIES THAT REDUCE THE ENVIRONMENTAL FOOTPRINT WHILE INCREASING THE EFFICIENCY OF BIOFUELS PLANTS.

- Develop policies and provide incentives that support continued investment in research and development of new technologies that reduce the environmental impact of biofuels production.
- Work with national leaders to advocate for low carbon fuel standards that utilize a technology and feedstock neutral approach, use scientifically sound methodology, and fully capture the environmental impacts and costs to the economy of imported oil.

PARTICIPATE IN STATE, REGIONAL AND NATIONAL CARBON FOOTPRINT DEBATES TO ADVOCATE FOR BIOFUELS TO RECEIVE FAIR TREATMENT AND THE METHODS USED TO ESTABLISH CARBON STANDARDS ARE SCIENTIFICALLY SOUND AND WOULD NOT CAUSE UNDUE HARDSHIP TO THE BIOFUELS INDUSTRY.

SUPPORT THE RESEARCH AND DEVELOPMENT AND EARLY STAGE COMMERCIALIZATION OF IOWA'S BIOCHEMICAL INDUSTRY TO DISPLACE PETROCHEMICALS.

NATURAL GAS IN IOWA AND NATIONALLY

Natural gas prices in the U.S. became increasingly volatile starting in the year 2000, hitting an average of $11.32 per Mcf by mid-2008. Prices have remained between $3 and $5.50 per Mcf since fall 2008. Natural gas prices have declined from their peak due to reduced demand, the recent economic downturn and a 49% increase in U.S. proven reserves since 1998. An estimated 6,600 Tcf of proven natural gas reserves exist worldwide. Approximately 41% are in the Middle East, 33% in Eurasia (largely the former U.S.S.R.), and 4.8% are in North America (Energy Information Association).

Competition for the resource, related security issues, and difficulty of shipping natural gas overseas are key concerns. A limited number of terminals in the U.S. can accept natural gas and some efforts to construct additional terminals have met resistance.

In 2008, natural gas produced 21% of the nation's electricity. Approximately 30% of the natural gas consumed in the U.S. in 2008 was in electricity production, 30% was used in the industrial sector, 25% in the residential sector and 15% in the commercial sector with only a small percentage used as vehicle fuel. Iowa receives approximately 7% of our electricity from natural gas. The Iowa industrial sector used 51% of the gas consumed in 2008 for concentrated heat production.

Natural gas will increasingly be used as a source of intermediate-load power, replacing coal as a cleaner and more adjustable power source to complement renewable energy. As Iowa wind capacity increases, there will be an increase in electricity generation from natural gas in the Midwest to provide this flexible intermediate-load power.

Additionally, natural gas has become an alternative source for vehicles. Currently, worldwide, there are more than 11 million natural gas fueled vehicles (Natural Gas Vehicles Global). In Iowa, Black Hills Energy is transitioning its fleet vehicles to run on natural gas and is installing a natural gas filling station in Dubuque to promote the use in public and private vehicle fleets in the city and surrounding area. This would be the first natural gas re-fueling station in Iowa.

Although most natural gas is produced in the U.S. now, increasing our reliance in the electric and transportation sectors will have price and security impacts long-term as we work to secure more supplies. Since Iowa has no natural gas production, dollars spent on natural gas largely do not stay in Iowa, but add value to other states' economies. Public health and environmental concerns about how natural gas is recovered and produced are also receiving attention recently, creating uncertainty in the market.

Natural gas price volatility is expected to continue. Use of Iowa-based renewable energy is one way to buffer this volatility and improve both our economic and energy security. ■

SUN PRAIRIE VISTA COURT APARTMENT ARRA PROJECT

Energy Efficiency and Utilize Renewable Energy Resources in Buildings

At a time when many apartment complex owners are more concerned about finding renters, Sun Prairie Vista Court Apartments is concentrating on reducing energy use by implementing and documenting the performance of new, energy-efficient technologies. This is not a new focus for Sun Prairie, however. When the apartment complex was built in 1987, owner Keith Denner crafted a plan to build energy-efficient, low-maintenance buildings. In doing so, he invested $5,000 more for each of the 1,075 units and proved the payback more than justified the expenditures.

Sun Prairie Apartments, with the assistance of $679,000 in American Recovery and Reinvestment Act (ARRA) grant funds, will further its strategy in utilizing new technologies to complete a number of energy efficiency projects on the property that include installing:

- Variable speed pumps
- Solar collectors to heat water
- Low-volume flush toilets
- High-efficiency boilers
- Energy Star commercial washers
- Induction and LED exterior lighting
- Energy Star metal shingles

This demonstration project is expected to employ 21 individuals, responsible for installing the energy-efficient products, as well as create an annual energy savings of $111,417. This project has not only received the attention of other apartment complex owners, but also the West Des Moines Police Department, who is interested in learning more about how the new exterior lighting technologies improve visibility and security.

"The most important part of this project is that it can be duplicated and can motivate others to save energy. We are going to change the way apartment owners build and maintain their buildings," said Keith Denner, owner of Sun Prairie Apartments.

Sun Prairie has agreed to be a demonstration site accessible to the public for teaching others about the benefits of the energy efficiency upgrades. By setting aside a classroom environment where the new technologies will be displayed, building owners and others who are unfamiliar with the performance of the new technologies will be able to see firsthand the effectiveness, as well as the money saving potential, of the efficient products.

Tenants are also benefiting from the community's energy efficiency. Sun Prairie guarantees electricity costs based on the size of the unit, without usage restrictions, and pays one-half of the cost that exceeds the guaranteed cost if a tenant goes over. This kind of assurance gives the apartment complex incentive to maintain and improve energy efficiency for its tenants while saving tenants money.

Utilizing readily available technologies has been a guiding principle of Denner's over the years, and he has proven that higher start-up costs of energy-efficient construction and upgrades can be profitable in the long run because of the resulting lower operational costs. As an innovator in the conservation of natural resources, the apartment complex also harnesses the power of nature, having planted 15,000 trees and shrubs on the property, which reduces the affects of the sun and helps cut utility costs. ■

"The most important part of this project is that it can be duplicated and can motivate others to save energy. We are going to change the way apartment owners build and maintain their buildings."

-Keith Denner
Owner of Sun Prairie Apartments

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PHOTOGRAPHY

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We owe credit to the many stakeholders who have helped Iowa achieve these results, either through their direct engagement, or through the constructive feedback we rely on them to provide us. We invite you to share your thoughts on this report and Iowa's energy vision going forward. We take this feedback seriously and always welcome it.

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